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of the
American Veterinary Medical Association

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Veterinary Science Exhibit at New York World's Fair Is Dedicated; Profession Praised

VETERINARY science took its place in the "World of Tomorrow" at the New York World's Fair on Friday, May 19.

Its exhibit, which proclaims to the millions who will visit the Medical and Public Health Building of the Fair that "Veterinary Science Protects Public and Animal Health," was formally dedicated.

The setting was perfect for a ceremony sponsored by the profession which serves both man and animals. The public was present in large numbers, crowding around the exhibit to see the ceremony. And the animals were there also, as appropriate guests of the occasion—a beautiful Belgian mare, a sleek Russian wolf hound, a ten-day-old calf, a placid dachshund and a wide-eyed donkey.

Oratorical tributes to the veterinary profession at a luncheon started the dedication ceremony. The popping of newspaper photographers' flashlights ended it. When it was all over, the exhibit remained as a testimonial to the vital function which veterinary science performs in modern civilization.

John R. Mohler, chief of the Bureau of Animal Industry of the United States Department of Agriculture, was guest of honor at the ceremony. As chairman of the arrangements committee, Dr. Mohler shouldered the responsibility of bringing the exhibit to completion.

Cassius Way, president-elect of the Association, was toastmaster at the luncheon. The speakers, in addition to Drs. Mohler and Way, were: C. P. Zepp of New York City, chairman of the Executive Board of the American Animal Hospital Association; John G. Hardenbergh, director of laboratories of the Walker-Gordon Laboratory Company and a member of the Executive Board of the A. V. M. A.; and Homer N. Calver, secretary of the World's Fair Advisory Committee on Medicine and Public Health.

In his talk, Dr. Mohler gave high praise to the veterinary profession. He concluded by cordially inviting visitors to inspect the exhibit and to make inquiries on veterinary and related subjects. Dr. Mohler said:

> A World's Fair of the expanse and magnificence that we view here today combines the handiwork of many professions, arts and crafts. Human capacity to envision the World of Tomorrow and then create it, even in symbolic form, will cause millions

to marvel at the audacity and ingenuity of the human mind.

Coöperative Spirit Extolled

Yet there are other human qualities that I prize fully as highly—the capacity and the willingness of different human groups to combine their knowledge and efforts and work together so effectively. The veterinary profession is proud to be one of these groups.

It has consulted and worked with other scientific and business interests and with artists and designers in creating an exhibit on "Veterinary Science Protects Public and Animal Health." The various units of the display illustrate diverse fields of veterinary endeavor.

By protecting the health of domestic animals, this science guards the human race to a material degree against tuberculosis, rabies, anthrax, and similar dangerous infections. It has made scientific contributions to the conquest over parasitic diseases of man as well as of animals. Veterinary science underlies the essential features of meat and milk inspection.

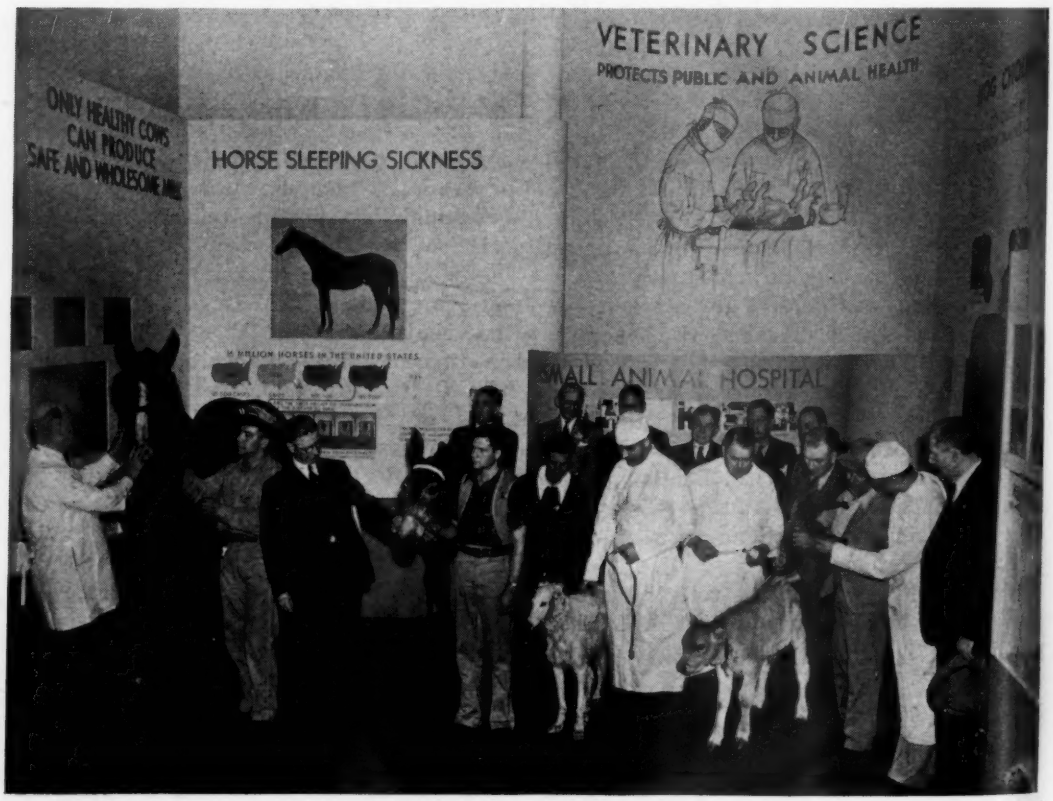
Economic Security Is Aided

It aids in the production of beneficial glandular extracts and of vaccines, serums and like products. Veterinary science adds to our economic security and the adequacy of our food supplies. It contributes to the enjoyment of life through sports and other recreations with special reference, in this field, to the welfare of horses, dogs and other animal friends. Finally, veterinary science strives diligently for the humane treatment of all sentient creatures.

In behalf of the committee and all other persons who have made this exhibit possible, I cordially invite visitors to inspect it and to make inquiries in veterinary and related subjects. To this end, I dedicate the exhibit on "Veterinary Science Protects Public and Animal Health" to the World of Tomorrow.

Dr. Way Pays Tribute to Veterinary Pioneers

Dr. Way, opening the speech-making at the luncheon, paid tribute to the pioneers



ANIMALS HELP DEDICATE EXHIBIT

Dedication of the veterinary science exhibit could not have been accomplished without animals. Here you see those which were brought for the occasion.

in the veterinary profession who brought it to its present high scientific estate. He said:

It is a privilege to participate today in the dedication of this A.V.M.A. exhibit at the greatest of all world's fairs. On behalf of our national association, I thank you all for your coöperation which has made possible this story of achievement in veterinary science. We all hope that a good portion of the millions who may attend the Fair will see the exhibit and thus have an opportunity to visualize the importance of a healthful animal industry to the welfare of our country and the part that the veterinarian plays in the health of its people.

In looking at the exhibit, the names of great educators, scientists and industrialists are brought to mind. For the record it seems fitting to mention a few of them. After all it is the work they did that laid the foundation for the milestones of accomplishment in veterinary endeavor, which in turn made possible the monumental achievements in the service to public health, to humanity and to our country.

The coöperation of the various branches of medical science and their interdependability is manifest in these achievements. Four great educators—James Law, Duncan McEachran, Andrew Smith and Alexander Liautard—came to the western hemisphere about three quarters of a century ago. They laid the foundations in education and research that made possible most of these great accomplishments.

YELLOW FEVER DISCOVERY MADE POSSIBLE PANAMA CANAL

In viewing the exhibit we first note the rôle of insects as vectors of disease. This brings to mind the names of Kilbourne, Theobald Smith and Veranus A. Moore. The discoveries made by these great scientists led to the discovery that the mosquito was the carrier of yellow fever by Dr. Walter Reid, that famous martyr to science who died that others might live. The elimination of the mosquito from the Canal Zone by Surgeon General Gorgas made possible the construction of the Panama Canal.

Next we see the eradication of tuberculosis and milk sanitation—milk made safe for human consumption by veterinary supervision and control. This brings to mind the pioneer work of Gail Borden and later of Claude D. Morris of The Borden Company. Also the work of Dr. Charles E. North, one of the first exponents of pasteurization and Grade A milk, and of Dr. Coit, the originator of the idea of certified milk. And, similarly, our esteemed honorary member of the A.V.M.A., Mr. Henry W. Jeffers of the Walker-Gordon Laboratory Company, whose vision made possible the construction of the "Dairy World of Tomorrow" with its 150 pure bred cows, one of the premier exhibits of this great World's Fair.

Probably the greatest accomplishment of all is the almost complete eradication of tuberculosis from this country by the veterinary profession under the direction and guidance of our distinguished guest of

GUESTS AT THE DEDICATION

Left to right: A. F. Staub, Cassius Way, M. Danziger, J. L. Carrolan, M. H. Sarvide, Mrs. F. W. Andrews, John R. Mohler, F. W. Andrews, Mr. Homer N. Calver, John G. Hardenbergh, Arthur G. Hall, M. L. Morris, C. E. Fanslau, C. P. Zepp, Robert S. MacKellar, Sr., and E. A. Durner.

honor today, Dr. John R. Mohler, chief of the great United States bureau of animal industry. This is truly a monumental work of achievement.

EARLY ENCEPHALOMYELITIS WORKERS MENTIONED

The section on equine encephalomyelitis brings to mind the work of Karl F. Meyer, C. M. Haring, Records and, finally, that great discovery by Ten Broeck, Wyckoff and Eichhorn of the effective vaccination with chick-embryo vaccine, making possible the control of the disease.

In connection with the modern treatment and hospitalization of small animals, dozens of names might be mentioned and the effective work of every member of the American Animal Hospital Association might be listed as a most valuable contribution to this humane field of veterinary endeavor.

In the hog-cholera section, we immediately think of Dorset, Niles and McBryde, who discovered and perfected the present serum and virus method of vaccination and control.

In the great field of meat inspection, we think of Daniel E. Salmon who organized the bureau of animal industry. A. D. Melvin who succeeded him and of John R. Mohler, its present chief, together with an army of veterinarians who effectively execute the greatest system of meat inspection in the world.

Finally, we have the great meat packing industry, which has contributed so liberally to make our exhibit possible and which, regardless of recent statements to the contrary, produces for human consumption the safest and best meat and meat products that are to be found anywhere in the world.

All of these great scientists and many more, all of these great industries and many more, have made it possible for the A.V.M.A. to bring to the attention of millions of people the story of a healthful animal industry without the benefits of which mankind would perish from the earth.

DR. ZEPP DESCRIBES SMALL ANIMAL HOSPITAL EXHIBIT

The small animal section of the exhibit was described by Dr. Zepp in his talk. He pointed out:

In the small animal hospital exhibit sponsored by the American Animal Hospital Association and friends of pet animals, we are attempting to portray by a panorama of pictures a modern small animal hospital. In this way, we picture the scientific developments available for the care of our best friend, the dog.

The exhibit shows the modern equipment, such as the x-ray and microscope, used by the veterinarian to aid him in the diagnosis of the ailments of the dog and cat. This equipment is very necessary to the veterinarian, as the dog or cat is not able to tell him its aches and pains. Instead, the veterinarian must find them and their causes.

We show that the most delicate operations are possible on a dog and that they are carried out under conditions similar to operations on humans. The exhibit stresses that all modern methods of anesthesia are used to relieve pain during operations and that sterilization by autoclave to prevent infections is common practice.

Other pictures in the exhibit show the American Animal Hospital Association's work of testing dog foods. We emphasize the importance of proper diets for dogs.

Dr. Zepp thanked Dr. Mohler and the exhibit committee for considering the small animal practice of sufficient importance to be included. He also thanked the members of the American Animal Hospital Association for assuming responsibility for the exhibit.

DR. HARDENBERGH STRESSES CLEAN MILK

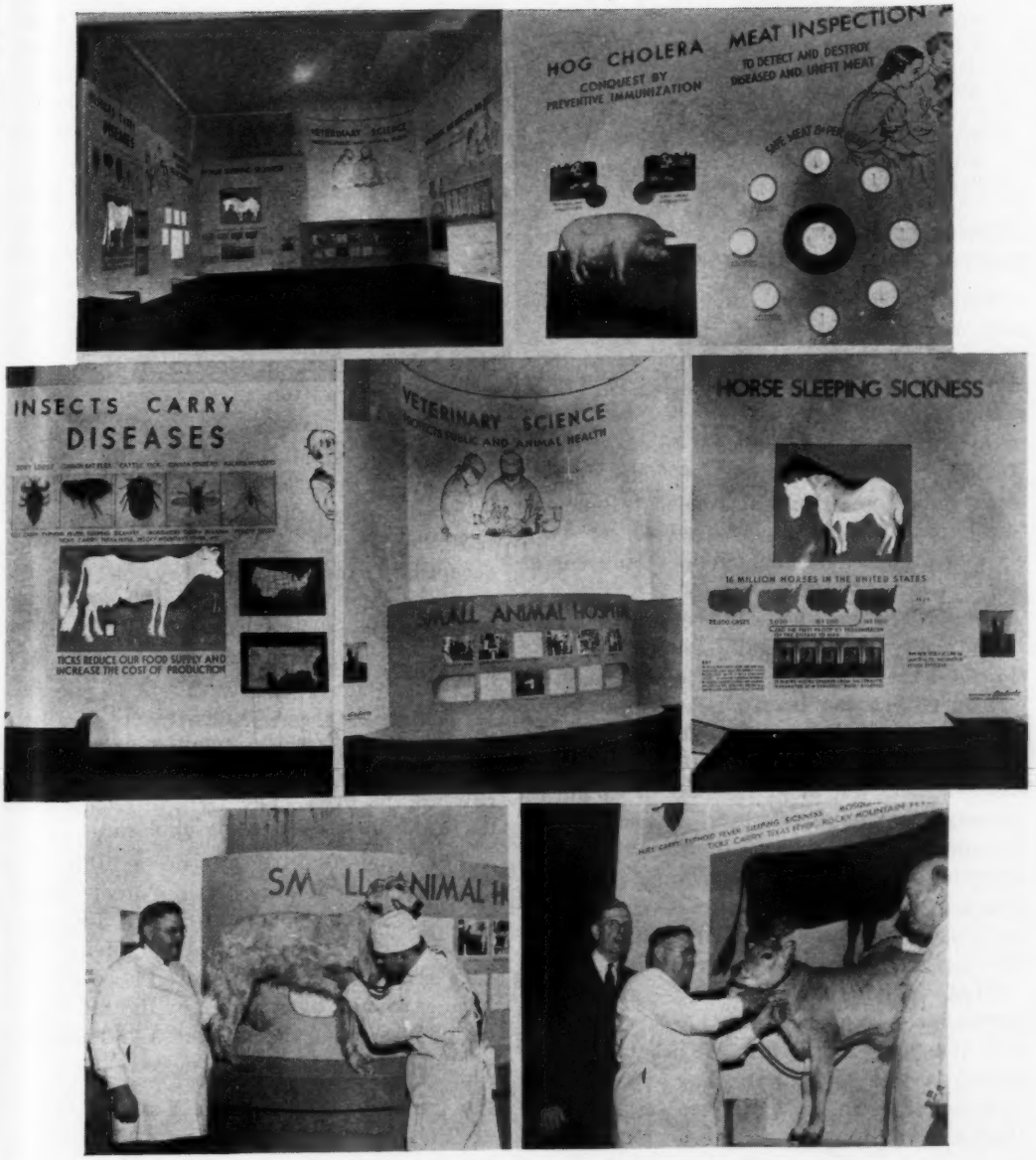
Dr. Hardenbergh extended the greetings of The Borden Company, of which the Walker-Gordon Laboratory Company is a subsidiary. He declared that The Borden Company has always felt keenly the responsibility for the production of clean and wholesome milk. He said that the company was pleased to participate in the veterinary science exhibit.

DR. MOHLER LISTS HONOR ROLL OF EXHIBIT SPONSORS

An honor roll of the sponsors of the exhibit was announced at the dedication ceremony by Dr. Mohler. His statement was:

In addition to expressing thanks to various associations and veterinarians whose names have been published as contributors to the World's Fair Exhibit Fund, the hearty appreciation of the Association is extended to the following for their generous support:

National Live Stock and Meat Board.
The Borden Company.
Lederle Laboratories.
Hog Cholera Serum Producers.
American Animal Hospital Assn.



THE EXHIBIT IN PANORAMA

Lower left: Prince Orloff, world-champion high jumper, is being examined by C. P. Zepp as Arthur G. Hall looks on. Lower right: A view of the inoculation of "World's Fair," ten-day-old calf born at the Fair. Arthur G. Hall does the work and Cassius Way and John R. Mohler watch.

Contributions to the Small Animal Hospital Exhibit were made by:

Kennel Food Supply Company.
The Kellogg Company.
Hill Packing Company.
Winthrop Chemical Company.
Hilo Company.
Abbott Laboratories
Cutter Laboratories.
Friends of Pet Animals as represented by:
Allied Laboratories.
Corn States Serum Company.

VETERINARY EXHIBIT IS ATTRACTIVE, INTEREST-COMPELLING

With many features which catch the eye and demand attention, the veterinary science exhibit is one of the most attractive in the Medical and Public Health Building at the World's Fair.

Dominating the exhibit, on the rear wall, is the phrase, "Veterinary Science* Protects Public and Animal Health." Beneath the lettering is a large drawing of two white-coated veterinarians operating on a dog.

In sections on the left, rear and right walls are the individually sponsored portions of the exhibit. To the left, as the visitor enters the booth, he sees the tick-eradication portion of the exhibit.

Under the caption, "Insects Carry Disease," appear five large insects—body louse, common rat flea, cattle tick, common house fly and malaria mosquito. The visitor is told that, "Flies carry typhoid fever and sleeping sickness. Mosquitoes carry malaria and yellow fever. Ticks carry Texas Fever, Rocky Mountain Fever, etc."

That "ticks reduce our food supply and increase the cost of production," is the subject of a large illustration, below, of a cow in sickness and in health. The tick-infested cow is thin and bony and gives far less milk than the healthy cow. Maps of the United States showing quarantine for tick fever of cattle appear at the right.

THE IMPORTANCE OF HEALTH IN COWS IS STRESSED

Moving to the right, the visitor reads that, "Only Healthy Cows Can Produce Safe and Wholesome Milk." This unit features the effective measures used in eradicating bovine tuberculosis. It illustrates also types of veterinary inspection, various tests, and the disposal of unsound animals. A device involving the flashing of green and red lights portrays the great reduction in bovine tuberculosis in the United States during the period 1924-1938.

On the rear wall, the visitor next has a chance to study, "Horse Sleeping Sickness." A horse affected with equine encephalomyelitis is contrasted with a healthy animal. Maps show the frequency of the disease during the past five years and stress its transmission to man. Control of the disease through vaccination is declared to be 100 per cent effective.

Next, the small animal hospital section is seen. Pictures show a modern veterinary hospital for small animals. The observer sees the rooms and equipment used for reception, examination, x-ray, electro-therapy, surgery, laboratory diagnosis and other purposes.

CONQUEST OF HOG CHOLERA IS SHOWN

"Hog Cholera—Conquest By Preventive Immunization" is the heading over the exhibit on the right rear wall. A large porker catches the eyes. The visitor is shown the declining losses from hog cholera.

The final feature of the exhibit is a large display dealing with, "Meat Inspection and Meat Consumption. . . . To Detect and Destroy Disease and Unfit Meat." The fact that safe meat costs eight cents per head is shown by a series of lighted circles which stress the thoroughness and economy of federal meat inspection.

NO VETERINARIAN SHOULD FAIL TO VISIT EXHIBIT

Unquestionably, the exhibit is a credit to the veterinary profession. It will make countless friends for the profession. Every veterinarian who visits the Fair will want to spend considerable time at the exhibit and he will want to urge his friends and clients to inspect it.

Truly, veterinary medicine has taken its place in the "World of Tomorrow."

*Unfortunately the contractor made a mistake and the word "Science" will be changed to "Medicine."

Somatodidymi Gastro-Thoracodidymus (Monstrosity in the Calf)

By T. C. FITZGERALD, D. V. M.

Department of Anatomy, College of Veterinary Medicine, Ohio State University, Columbus, Ohio

THE MONSTROSITY was brought to the College of Veterinary Medicine, Ohio State University, by Dr. Walter Krill, who gave the following history. The specimen's dam was an eight-year-old Guernsey cow, sired by a Holstein bull. The delivery was made without assistance; however, the cow suffered from a temporary case of obturator paralysis. No history of the sire or dam could be obtained in regard to hereditary factors.

Full term had been reached, death occurring at birth, as no evidence of respiration was presented upon dissection.

The specimen presented may be classified as equal conjoined twins, as each of the individuals was approximately the same size and the composite specimen symmetrical in form. The zone of union was ventral, involving the thoracic and abdominal cavities. The heads and necks were completely separate, four thoracic and two pelvic limbs being present.

The classification of such an individual according to Gurlt, and as presented by Fleming,[1] is "somatodidymi gastro-thoracodidymus."

Double monstrosities are found chiefly in the ox, rarely in the sheep and sow, and even more rarely in the mare. Occasionally birth takes place without difficulty, and the creatures may live.

History and Causes of Monstrosities

Not until the end of the 18th century was the study of teratology begun with a scientific spirit, and anomalies shown to be only simple modifications or irregularities in the normal developmental processes. As a result, there still prevails a correlation of superstition and fear with the appearance of monstrosities.

Twinning by itself is considered to be an abnormal process, even though each twin may be physically separate and anatomically perfect. When twins are physically connected in any degree, the abnormality is universally recognized and we look for the cause. According to Gurlich,[2] twins occur in the human family once in every 85 births.

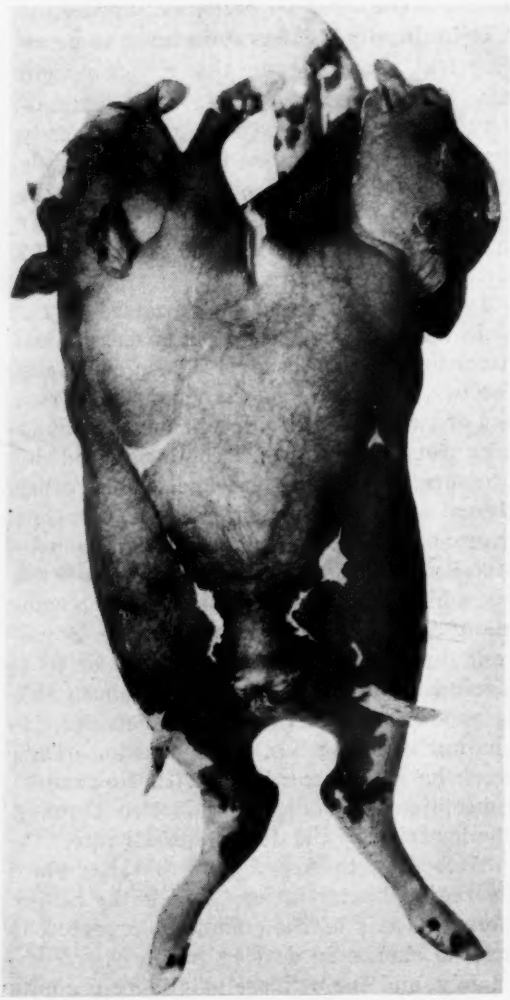
Two theories have been advanced to explain the formation of double monstrosities. According to one, there have been originally two ova, which may have been derived from one or two Graffian follicles rupturing at or near the same time, becoming fused by pressure in their passage. The other theory supports the existence of only one ovum, by division of which the double monstrosity is formed. The latter theory is the one which is gaining acceptance and is substantiated by experimental evidence. Stockard,[3] by lowering the temperature or by a diminution of oxygen supply, has been able to produce a wide variety of anomalies, including twinning. In the conclusion of his work he is in accordance with Newman's[4] conception of monster production through the lowering of the developmental rate.

According to Arey,[5] growth takes place by regional accelerations, and if the proper potential axis of the embryo is arrested, it has no chance to develop properly or completely, and one or more neighboring points may then assert themselves as additional embryonic axes.

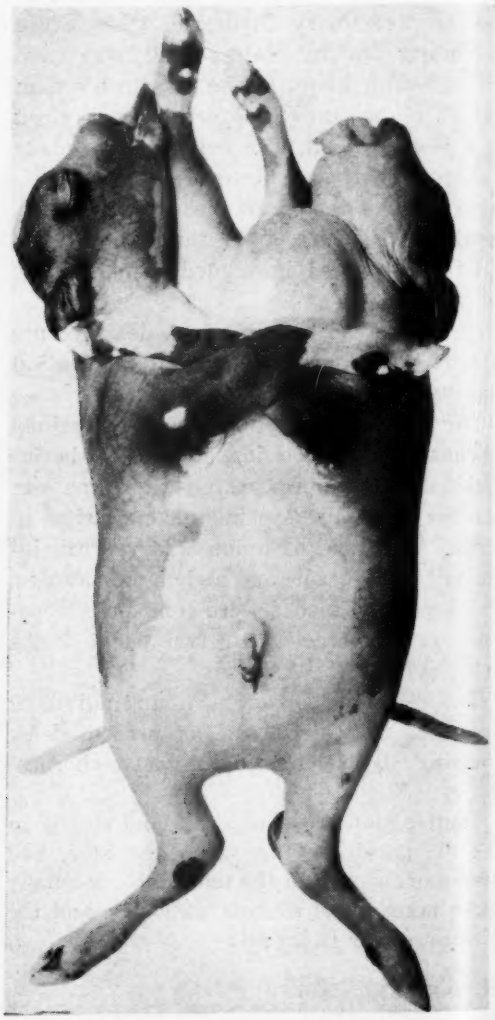
The exact time for twinning in the fish is at the onset of gastrulation.

Newman[6] demonstrates three methods by which twins may be formed: (1) By splitting of the blastoderm before the axis of

symmetry is laid down, each portion producing an embryo; (2) a single blastoderm loses its axiate organization so that two separate gastrulation points appear, each forming an embryonic axis and each axis separating and producing an embryo; and (3) a single axis separates into component bilateral halves which then regenerate and grow independently into two embryos.



Dorsal view of the monstrosity.

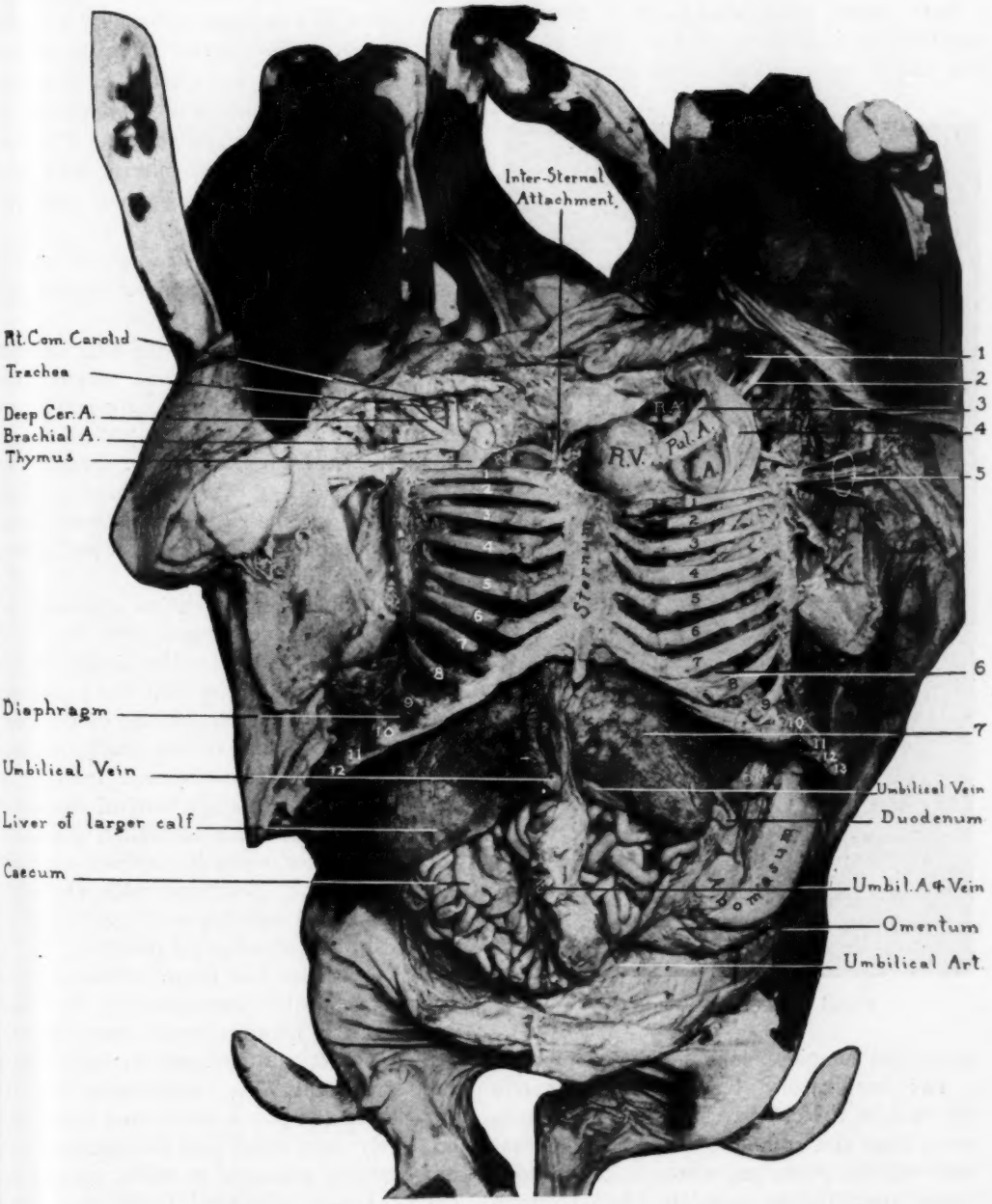


Ventral view of the monstrosity.

The first method is uncommon among vertebrates. The second method, by double gastrulation of a single blastoderm, is common for many animals. According to Newman and Wilder, the longitudinal fission of the primitive embryonic axis is an important method and explains satisfactorily the incompletely separated embryos or conjoined twins.

THE ANATOMY OF THE SPECIMEN

Osteology: X-ray negatives and dissection revealed two complete skulls and vertebral columns, the formula of each C.7, T.13, L.6, S.5, CY.15. Thirteen pairs of ribs were present in each calf. Two sterna were present; each was joined ventrally to the costal cartilages of both calves, but no



Ventral dissection; thoracic limbs reflected. (1. Left carotid artery. 2. Right carotid artery. 3. Aorta. 4. Pericardium. 5. Brachial plexus. 6. Diaphragm. 7. Liver of smaller calf.)

skeletonal attachment was present between the sterna.

A complete skeletonal development appeared for each of the four thoracic limbs.

Both sacra articulated with a common oscoxae, the space between the wings of the ilia being quite wide. Two pelvic limbs

Dorsal x-ray of the monstrosity.

presented complete skeletonal developments.

The respiratory tracts were complete for each of the calves. The digestive tracts were dual and complete as far as the first part of the jejunum, where a union took place, resulting in a single tract through the remainder of the digestive system.

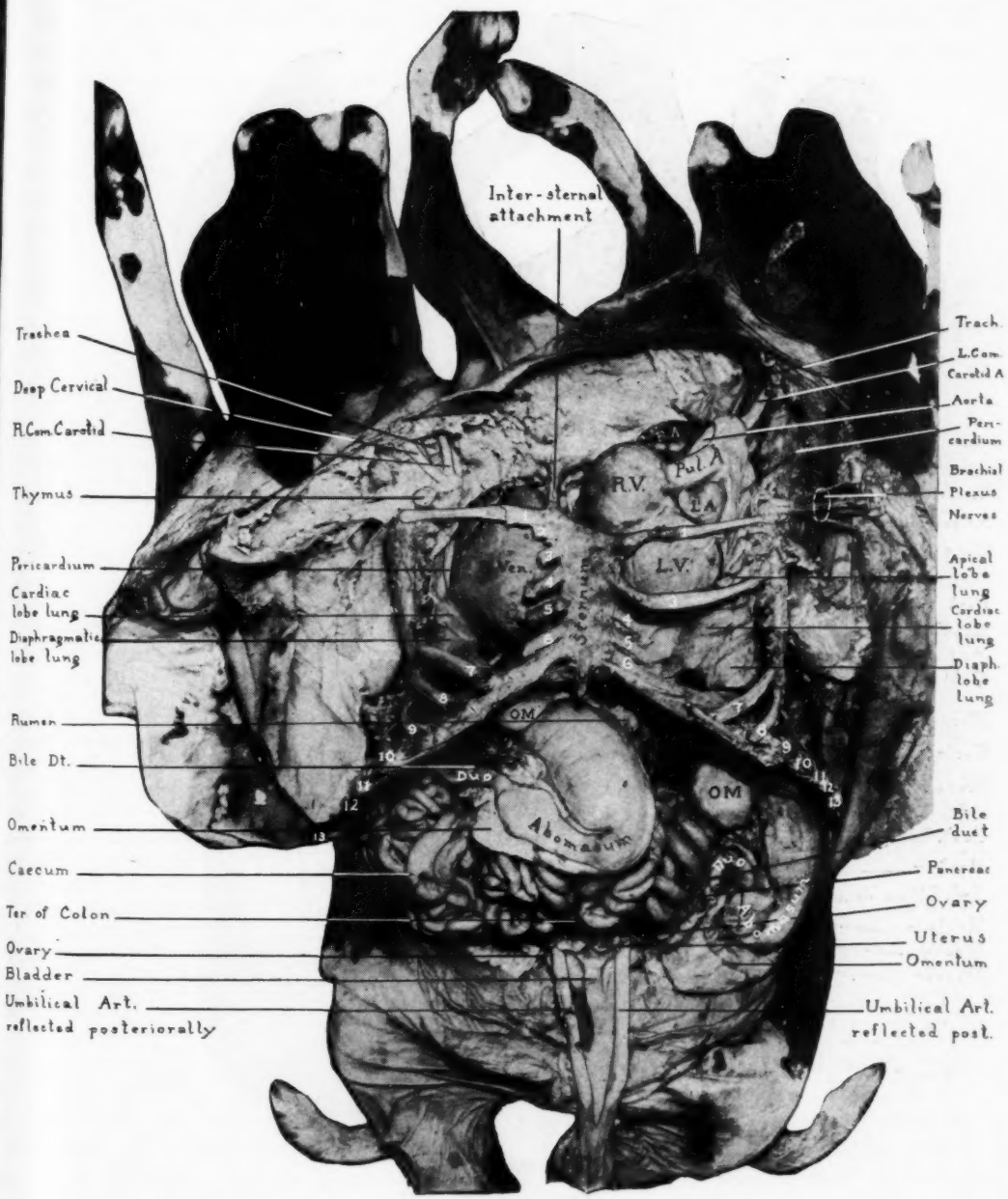
The urogenital system at first appeared to be a single apparatus, as one large kidney and ureter were found on opposite sides of each calf. Each large ureter entered a large rudimentary bladder ventral to the rectum in the normal position. The lumen of the bladder was in free communication with a large, persistent lumen of the urachus. The vagina was completely formed, with the exception of an incomplete separation from the termination of the rectum, where only a thin shelf-like membrane separated the lumina of the rectum and vagina. The free edge of the separating membrane measured one-half inch from the common anal-vulvular opening.

As the dissection progressed, a second, very small, urogenital apparatus revealed itself.

On the remaining opposite side of each calf there appeared a second smaller kidney joined to a correspondingly small ureter, which was in connection with a second bladder, situated dorsally to the termination of the colon. Very thin strands of a joined uterus and vagina also were found dorsal to the colon and rectum. No second pair of ovaries was found.

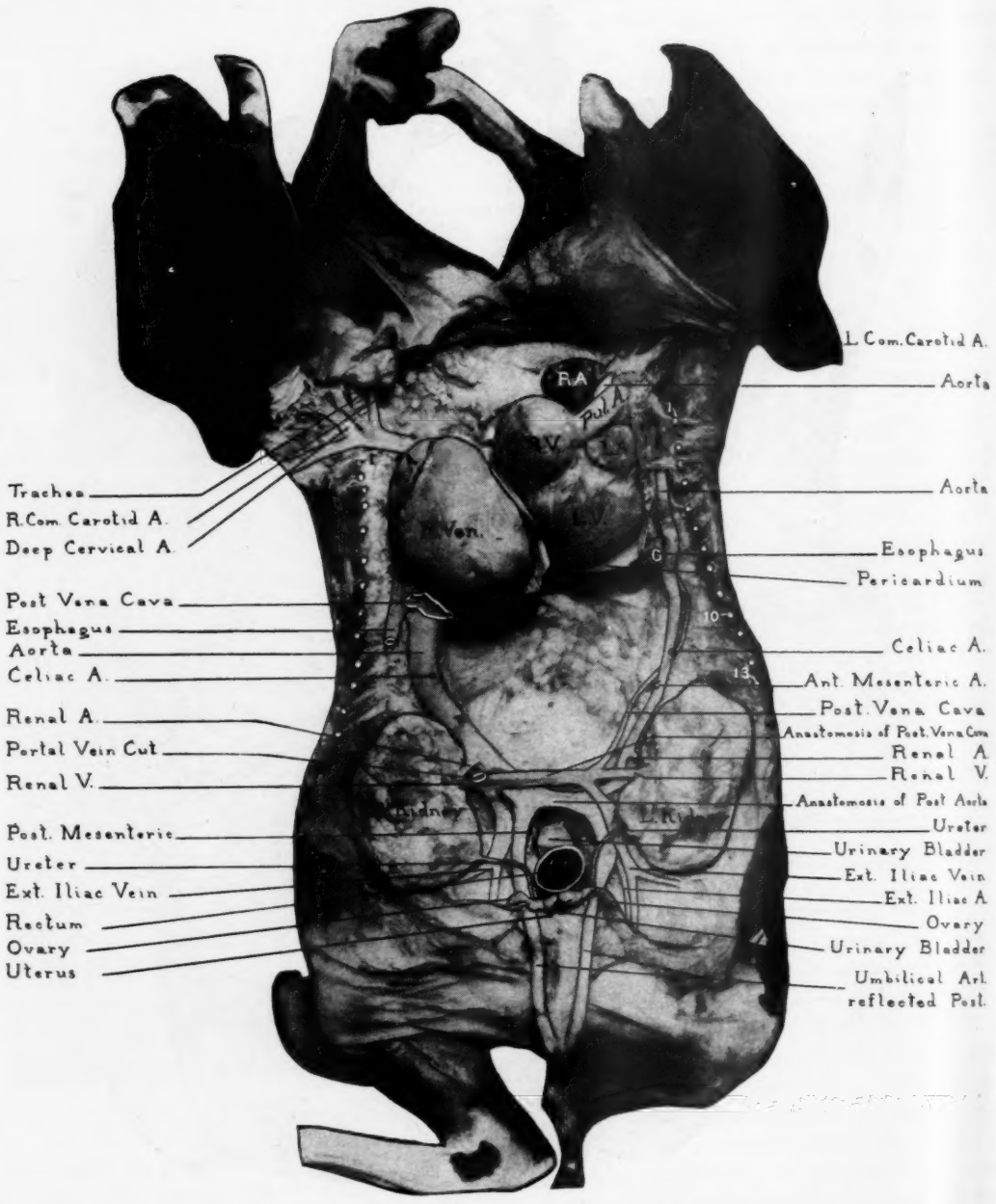
Photographs of the entire specimen revealed an apparent ectopiacordis in one of the individuals, but when the dissection was completed, it was found that the heart was not confined completely outside of the thoracic cavity, but that it was easily replaced through a very large thoracic inlet to its normal position. As the ventral closing of the body cavities had not taken place, the pericardial sacs were in contact ventrally and the sternal junctions with the right and left costal cartilages of each calf remained in a ventro-lateral position.

The ventricles and larger arteries of the misplaced heart appeared to be quite normal. The foramen ovale remained open and the ductus arteriosus persisted by a very free and wide communication. The auricles of the above-mentioned heart were relatively very small and rudimentary; the myocardium appeared as thick, spongy layers of loosely arranged trabeculae. Especially was this marked at the blind extremities of the cavities. No posterior vena cava was found penetrating the diaphragm or entering the auricle of the smaller calf.



Ventral dissection; livers removed; umbilical structures reflected.

The vena hemiazygos circulation appeared to be the only venous return of blood from the abdominal cavity dorsally. It was noted that the internal thoracic veins were relatively large, probably a compensating factor for the venous return of blood ventrally. The aorta, although complete in its branchings, was correspondingly smaller in the small calf. The anterior mesenteric branches were found to supply not only the short, dual development of the intestines of the smaller calf, but also to continue throughout the entire small intestinal mass of both calves. No anterior



Ventral dissection, showing vascular and urogenital systems.

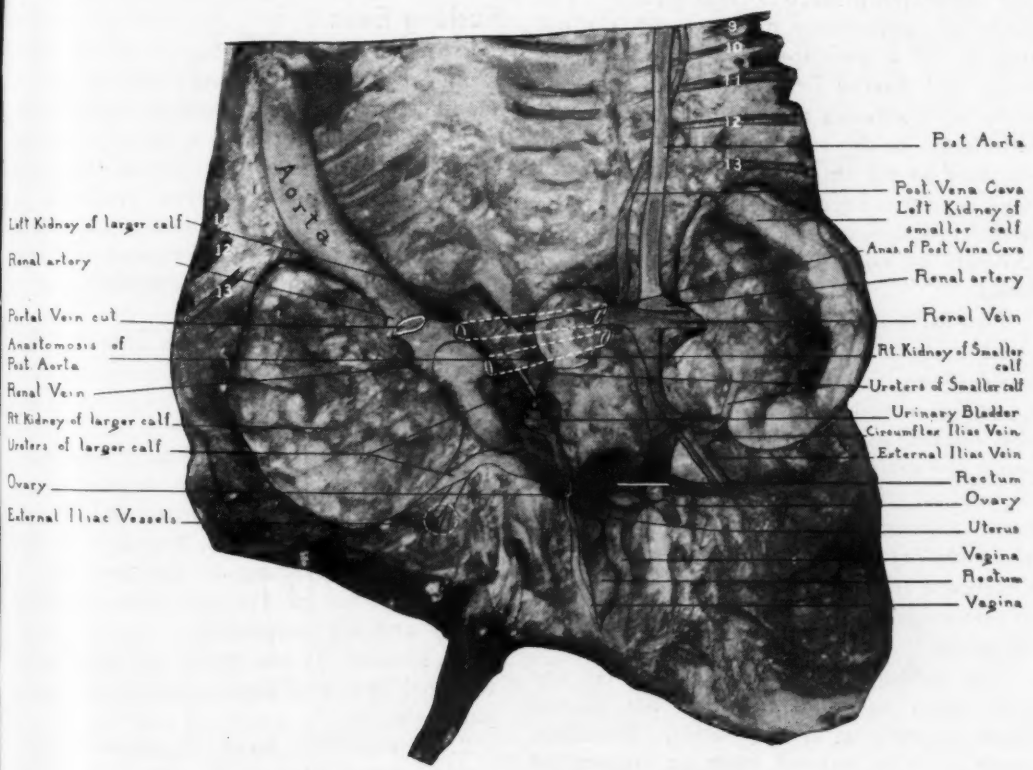
mesenteric arteries of the larger calf were found. At the termination of each aorta a very large anastomotic branch was found connecting the arterial circulatory systems of the calves. As only one external iliac artery branched from the termination of each aorta, it seems logical to suggest that the anastomotic branch was formed from a union of the remaining two external iliacs. Through this abnormal arrangement, blood could flow freely from one calf to the other. The posterior mesenteric artery was given off the termination of the aorta of the larger calf, at a point just posterior to the

junction of the anastomotic branch with the aorta proper.

One large umbilical artery was derived from the larger of the internal iliacs of each calf, carrying blood to the placenta. The returning umbilical vein entering the common umbilical opening was found to divide into two umbilical branches just before entering the livers. The smaller branch was found to enter the liver of the smaller calf and the larger branch, the larger one.

The livers were very intimately fused; however, it was very easy to demonstrate the bile-duct junctions of each liver to the duodenum of each calf, this indicating that the primordia of the livers were from both digestive tracts. The umbilical vein of the larger calf promptly entered a ductus venosis, which conducted the placental blood to the posterior vena cava. The smaller umbilical vein likewise entered a ductus venosis but instead of conducting the placental blood to a posterior vena cava of the smaller calf, it deviated to a course through the liver of the larger calf and joined the posterior vena cava in common with the preceding ductus venosis.

This peculiar arrangement indicated that all of the placental blood must be returned to the larger calf, and that any part of it going to the smaller calf would be drastically diluted in its course through the liver, vena cava, heart and aorta of the larger calf, before having any chance of entering the vessels of the smaller one. The posterior vena cava of the smaller calf was found to be very poorly developed anteriorly. Its course followed closely that of the aorta, never coming in close proximity to the liver. It penetrated the hiatus aorticus and finally terminated just beneath the seventh rib as a small anastomotic branch of the vena hemiazygos. Judging from the gradually increasing size of the main venous trunk from its anterior to its posterior extent, it was considered that the venous



Deep ventral dissection, showing urogenital systems.

blood must flow in the same direction. This abnormal arrangement indicated a large quantity of the venous blood of the smaller calf would leave its immediate system and pass through the large venous anastomotic connection to the posterior vena cava of the larger calf.

The blood vascular system of the larger calf presented a more normal picture. The heart was apparently normal, with the exception of a persistence of the foramen ovale and ductus arteriosis. No anterior mesenteric arteries were found, as the blood circulation to the small intestinal mass was supplied by the smaller calf. The posterior vena cava was exceptionally large, since the portal circulation and placental return apparently of both calves contributed to its blood.

Two facts stand out in the composite circulatory systems of these calves. First, the blood returning to the smaller calf was apparently second-hand and of poor quality, and second, any blood which might directly reach the system of the smaller calf must do so against the normal direction of flow of some vessels. These factors present a plausible explanation as to the cause of the difference in size and completeness of the development of the two conjoined individuals.

The author does not wish to leave the impression that his interests are chiefly those concerning monstrosities. However, much is to be learned, from an anatomical and physiological standpoint, from a thorough study of their developments.

ACKNOWLEDGMENT

Credit is due Dr. James D. Grossman and Mr. Robert Getty for valuable assistance in the preparation of the manuscript and illustrations.

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[3]Stockard, C. R.: Amer. Jour. Anat., xxviii (1921), pp. 115-277.
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Viability of Spermatozoa

Spermatozoa survive best at an optimum pH of 7.4 to 7.6 and die rapidly in a slightly acid media. Salts of lead, copper and nickel are toxic for them. On that account instruments used for insemination should be nonmetallic.

Flushing Ewes

Professor Ernest G. Rizman of the University of New Hampshire, Durham, N. H., has had considerable success in experiments he is conducting to produce sheep that will bear twins. Seventy per cent of the time, he reports, twins have been produced in his experimental flocks. Occasionally there have been triplets. This experiment was started by Alexander Graham Bell.

Accidents of Epidural Anesthesia in Cows*

While epidural anesthesia in bovine practice is a precious procedure, it may be accompanied or followed by more or less serious sequels. Fortunately, they are not frequent. The following are enumerated:

1. Paralysis of the tail that improved slowly and not completely.

2. Abscess at the point of penetration followed by lateral incurvation of the tail—paralysis.

3. Impossibility to obtain anesthesia two weeks after a previous injection which was followed by abscess, attributed to obstruction of the canal with inflammatory reactions.

4. Sudden fall of the animal due to unexpected energy of the anesthetic, resulting in fracture of the horns and strangulation from the tie shank.

5. Anesthesia followed by a fall that lowered the head below the hind quarters, resulting in alarming symptoms, which, fortunately, yielded to a hurried change in position.

The epidural space of cows is a smooth, wide-open channel along which liquids rapidly gravitate.

*W. Hoffman. Schweiz. Arch. f. Tier. Abst. in Ann. de Méd. Vét., March, 1938, p. 121.

Parturient Hemoglobinemia of Dairy Cows*

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A DISEASE of high-producing dairy cows, occurring two or three weeks following calving and characterized by anemia, hemoglobinuria and general weakness is common in the intermountain areas of the United States. Veterinarians report that the disease has existed in these areas for the past 20 years. Until relatively recent times, however, nothing concerning it had appeared in American literature.

The investigations reported here are the result of studies (which are still in progress) begun by the authors in 1936. Hjärre[1] reported on extensive experiments with this disease in 1930. The results of his findings will be referred to frequently in this report. He termed the disease "puerperal hemoglobinemia." Wallace[2] used the term "parturient hemoglobinuria" and more recently Farquharson and Smith[3] called it "post-parturient hemoglobinuria." In this report the term "parturient hemoglobinemia" will be used. Inasmuch as the disease is primarily a hemoglobinemia, this term would seem more appropriate than hemoglobinuria, which may not always occur.

Gangrene of the right hind limb resulting from parturient hemoglobinemia. The line of demarcation is at the proximal end of the first phalanx.

INCIDENCE

The disease has been reported in Norway, Sweden, Denmark, Finland, Austria and Ireland. Hjärre[1] stated that in Sweden the disease was apparently first recognized in the 1890's, and that Ekelund described it in 1904 under the name "puerperal hemoglobinuria." Wallace[2] disclosed that the disease has been known in Scotland for a century. It is not, therefore, of recent origin but has no doubt existed for many years, particularly in areas which have been farmed for long periods of time.

The symptoms are somewhat similar to other diseases producing hemoglobinuria and consequently, until more recent times, it had not been recognized in America as a distinct disease entity. Farquharson and Smith[3] have recently reported the disease in America. Hutyra, Marek and Manninger[4] describe the disease under the title "puerperal hemoglobinemia."

In the United States there have been various conditions in cattle characterized by hemoglobinuria and known locally as red-water disease. These include Texas fever, pyelonephritis, bacillary hemoglobinuria, and hematuria. Not infrequently veterinarians in the Rocky Mountain regions have confused parturient hemoglobinemia with some of these hemoglobinuria diseases.

Personal communications with veterinarians in the western United States reveal that the disease occasionally occurs in certain areas west of the Mississippi River. There is reason to believe that in Utah the disease is much more prevalent than was formerly suspected. Many mild cases pass unnoticed and many cases not brought to the attention of veterinarians are not diag-

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nosed. Nine veterinarians reported a total of 143 cases during the stable season 1937-38. Based on the fact that the disease is common in some sections of the state not supplied with veterinary service and that this service is not always requested even though available, it has been estimated that there are approximately 300 cases annually in Utah and probably a similar number in Idaho.

CONDITIONS UNDER WHICH PARTURIENT HEMOGLOBINEMIA OCCURS

Utah practitioners have reported a tendency for the disease to be endemic on certain farms. In a group of 44 farms where the disease recently occurred, the authors found that 16 had experienced the disease previously. Some tendency for a second or third recurrence in individual cows was observed. In the 44 cases studied, however, only three cows had been previously attacked. One entire herd of five cows developed the disease in 1935. There was one case on this ranch in 1936 and there has been none since. The owner attributed control to discontinuation of beet pulp in the ration. One farmer milking ten head of cows reported that five of them developed parturient hemoglobinemia within a few weeks of each other. Most Utah veterinarians state that the incidence of the disease appears to be on the increase.

Evidence given by Hjärre[1] shows that the disease occurs more frequently in dry seasons than in seasons of abundant moisture and he inferred that the kind of feed has a certain bearing on the disease. He reported some European workers as believing beets or mangels as an inciting cause. The discussion which followed the paper by Wallace[2] brought out that a ration containing liberal amounts of turnips and less concentrates was especially favorable to production of the disease.

There seems to be a definite relationship between the occurrence of this disease in Utah and Idaho and the rations fed. Farmers who feed only alfalfa and sugar-beet pulp nearly always state that they have encountered the disease on their farms at some period. On the other hand, in adjacent areas where beet pulp is not as commonly fed, the disease is not seen as frequently. In 44 cases of parturient hemoglobinemia, occurring in 1937 and 1938, on which data were collected, the following incidence of the disease was found when different types of rations were fed:

Alfalfa, pulp, and molasses	11 cases
Alfalfa, pulp and grain	10 cases
Alfalfa only	5 cases
Alfalfa and pulp	4 cases
Alfalfa, pulp, molasses and grain	3 cases
Alfalfa, molasses and grain	3 cases
Alfalfa and grain	3 cases
Alfalfa, pulp and pea silage	2 cases
Alfalfa and molasses	1 case
Alfalfa, molasses and pea silage	1 case
Oat and clover pasture	1 case

In 30 of the 44 cases pulp was included in the ration and 35 cases were fed a ration which included sugar-beet by-products in some form. In 19 cases grain, which usually consisted of chopped barley and less frequently barley mixed with wheat or wheat middlings, was included in the ration. In the majority of cases grain was not fed during the entire season but was begun at about freshening time and continued for a few months. The amount, when fed, averaged 4.2 pounds daily. Wet beet pulp was fed at the rate of 25 to 50 pounds daily. Summer pasture was available for 32 of the 44 cases. Only one case of the disease occurred at the time the animals were on pasture. This was in October.

In addition to the 44 cases in Cache county listed above, information recorded by seven veterinarians in Utah shows that in 1937-38 they treated 117 cases of this disease. In 87 of these cases wet beet pulp and alfalfa were included in the ration. The number of animals having grain in their diets was not determined. Smith[5] encountered in his practice approximately 75 cases of parturient hemoglobinemia during the winter of 1934-35 in the Lewiston, Utah, vicinity. The following winter the incidence dropped to a low mark of about 30 cases. Smith attributed this lowered incidence to the fact that the small sugar-

beet crop of 1935-36 necessitated the feeding of less pulp. A similar condition was reported by Swalberg[6] in Utah County. Usually he treated a "great many" cases but during the season 1936-37 he was called on only five cases. He attributed the lowered incidence that year to a scarcity of beet pulp. He treated 26 cases during the season 1937-38. McMillan[7] of Idaho reports a few cases of the disease when cows were fed heavily on potatoes.

The disease occurs largely during the stable season. During the two seasons, 1936-37 and 1937-38, 105 cases on which the present authors have information, occured in the following months:

October	1 case
November	4 cases
December	11 cases
January	15 cases
February	33 cases
March	31 cases
April	9 cases
May	1 case

Evidence to date indicates that the character of feed in the winter season is largely responsible for the seasonal occurrence. The fact that many cows in this area are bred to calve in the fall months also would tend to make the disease seasonal.

In this study the disease was always found to be post-parturient. In 39 cases studied, the range was between eleven and 42 days, with an average of 20 days between parturition and symptoms of the sickness. A few reports by practicing veterinarians indicate the disease occasionally occurs 4 to 6 months post partum. The following relationship of age to incidence of the disease was found:

Order of Calving	Cases of the Disease
1st calf	0
2nd calf	4
3rd calf	12
4th calf	15
5th calf	6
6th calf	1

Hjärre[1] found that most of the cases occurred after the third to the sixth calving. No cases were observed following the first calving and after the sixth calving the incidence became greatly reduced. Farquharson and Smith[3] stated that the third calving is the most favorable period.

Parturient hemoglobinemia in Utah and Idaho has not been observed in the beef breeds of cattle. The disease was found to attack only cows producing large quantities of milk. In a study of 38 cases of parturient hemoglobinemia, the cows were giving an average of 58 pounds of milk daily at the inception of the disease. The range was between 40 and 77 pounds. In all but two instances the owner stated that the affected cow was the best producer in the herd or ranked with the best producers. As a rule, cows which developed the disease were in a fair to high state of fleshing at parturition, although several cases were quite thin.

Hjärre,[1] Ekelund (reported by Hjärre) and Farquharson and Smith[3] also observed that the disease attacked only high-producing cows. Ekelund especially emphasized the relationship between milk fever, puerperal hemoglobinemia and acetonemia, and collected them under the designation of "lactation diseases." All three of the diseases are associated with animals capable of high milk production and attack only cows which have finished one or more lactations.

SYMPTOMS

The exact day of inception of the disease was sometimes difficult to estimate on the basis of information given by the caretaker. The figure used here refers to the first day on which symptoms of any character, such as inappetence or colored urine, were noticed. There is reason to believe, however, that blood changes begin some days before such symptoms are noted.

In a study of 20 cases of the disease, eight began with a hemoglobinuria, with no decrease in appetite or milk production taking place until one or two days later. In twelve cases the first symptom noticed was a decrease in appetite and a slight decrease in milk production. Six of these twelve cases were observed to be eliminating reddish-colored urine and it is conceivable that all of them were eliminating

colored urine, since the act of urination is frequently not noticed by the attendant. It would appear that hemoglobin-colored urine precedes, in most instances, inappetence and lowered milk flow.

A characteristic early symptom is an accelerated pulse. As the disease progresses, the heart beat becomes so forceful that it is audible some distance from the animal, and the brisket region may show a jerking from the impact of each heart beat. The pulse may vary between 80 and 130, usually being the highest from the third to the sixth day.

Cow affected with parturient hemoglobinemia on the third day of illness. The animal is weak, gaunt, depressed and anemic. Erythrocyte count, 1,500,000.

In general, the body temperature was not greatly increased, although nearly all animals showed some increase during the period of illness.

The temperatures from 103° to 104° F. were reported by Farquharson and Smith.[5] Ekelund and Reisinger[9] reported a temperature of 102.2° to 105.8° F. in the early stages, which soon fell to normal or subnormal. Observations by the present authors suggest that the temperatures early in the disease are lower than those found at later periods (table I).

The visible mucous membranes become anemic and later very icteric. The teats are cold and blanched. In fact, an alert milker can detect the first symptoms of the disease by the lack of heat in the teat as it is grasped for milking. The ears droop and the abdomen is gaunt. Not infrequently animals exhibit great thirst. Extreme weakness with a staggering gait is common. Some individuals exhibit a diarrhea but the majority are constipated. When constipated, the feces passed, if any, are dark and may be covered with mucus. The feces are highly impregnated with bile stains.

As mentioned heretofore, many cases exhibit hemoglobinuria for one or two days before there is reduction in milk production or appetite. Frequently the normal red-cell count is reduced one-half, while at the same time the milk flow remains practically undisturbed, even though there has been much loss of body flesh.

Unless death intervenes, improvement is usually noted five days following the first symptoms. Cases which recover seem to show the greatest depression and weakness the first day the urine becomes clear. Studies on a number of animals showed

that the red-cell count usually continued to drop one or two days after the urine had cleared. A depraved appetite, exhibited by chewing or licking foreign objects and consumption of large quantities of salt, is manifested during the convalescent period. The period required for complete recovery varies from one week to two months. Many cows do not completely regain their presickness milk-production level and their former body fleshing during that lactation period. However, cows which are placed on a ration containing liberal amounts of grain, upon return of appetite have always made a more prompt and complete recovery than those kept on alfalfa and beet pulp.

subcutis area along the back and gravitated downward. There was no evidence of metritis in the cases observed by the authors. This is in keeping with observations made by European workers.

It is not uncommon to detect the odor of acetone on the breath and in the milk of affected cows. Occasionally the milk is tinted with hemoglobin. There appeared to be delayed estrum following parturition in cows which developed the disease.

Data obtained by the authors on 242 cases occurring during the past few years showed an average mortality of 19.4 per cent. Cases developing later than three weeks following parturition had a lower mortality than those developing at shorter intervals after parturition.

TABLE I—Temperatures of cows at various periods of illness with parturient hemoglobinemia.

DAY	CASES IN WHICH TEMPERATURE WAS TAKEN (NUMBER)	TEMPERATURE VARIATION (DEGREES F.)	AVERAGE TEMPERATURE (DEGREES F.)
1st	2	100–101.8	100.9
2d	10	99–103	101.2
3d	8	101.1–102.3	101.9
4th	5	101.4–105.4	103.2
5th	4	101–102.6	101.8
6th to 13th	13	101.6–103.6	102.8
14th to 19th	6	102–103	102.3

The pronounced anemia and possibly reduced blood volume results in insufficient nourishment to tissues of the extremities and disturbs circulation to those parts. In northern Utah it is not uncommon to see affected animals with frozen extremities, when the attack occurs in cold weather. This results in the loss of the tail, ears, or feet. Less commonly, cases seem to exhibit a type of urticaria in which small, hemorrhagic areas develop which necrose, coalesce and leave a raw, necrotic area. More frequently the skin necrosis is confined to the teats or lower extremities of the limbs, but one case was said by the farmer to develop "sores" over the entire body. An emphysematous condition under the skin of teats affected with skin necrosis was described by McMillan[7] and he described another case in which an emphysematous-like condition occurred in the

The mortality reported by other investigators varied considerably. Ekelund[8] reported a variation between 15 and 30 per cent, Stenius,[10] 50 to 70 per cent. Schee[11] estimated 33 per cent, Wallace,[2] 20 per cent, and Farquharson and Smith,[3] 10 per cent.

ANATOMICAL CHANGES

Autopsy was performed on six animals affected with parturient hemoglobinemia. The outstanding change found was an icterus of all body tissues. The blood was watery and dark. One case showed blood-colored fluids in the pleural and peritoneal cavities. The liver of all cases was yellowish, sometimes slightly swollen and usually showed yellowish-grey patches 1 cm. and smaller in diameter. One case showed numerous bright red petechiae on the liver

surface. The gall-bladder contents were syrupy. In one case 375 cc. of gall was removed from the bladder. The spleen was not found to be swollen but was dark and pulpy in one case. Two cases showed small hemorrhagic areas on the mucosa of the small intestine, in addition to a general diffuse inflammation of those organs. No change was noted in the abomasum. The rumen was usually full and the intestinal contents watery. Two cases showed petechiae on the epicardium. The urine bladder was always filled with coffee-black urine.

The hepatic lymph glands were found to be swollen and edematous. One case showed a gelatinous infiltration about 4 cm. in thickness which completely surrounded the esophagus and extended throughout its length. Mention has already been made of the urticaria-like lesions occasionally noted along the back, the teats and on the limbs. The femur and tibia of one case were examined and found to be in a depleted state.

The pathological changes are in general similar to those observed by Hjärre,[1] who also observed fatty degeneration of the kidney, hemorrhagic ulcers on the mucosa of the abomasum and numerous pinhead size, gray-yellow or gray-red lesions on the capsular and incision surface of the liver.

HISTOPATHOLOGY

Examination of some of the tissues of six cases showed that the liver had undergone the most extensive changes. A parenchymatous degeneration and necrosis centered around the central vein. Fatty degeneration with hemosiderosis was especially evident in a zone immediately outside the necrotic area. Fatty infiltration was general throughout the lobule of most cases. Pronounced fatty degeneration of the kidney in the region of the straight collecting tubules and hemosiderin deposit were noted in one case. Small amounts of hemosiderin deposit were noted in the capsular-glomeruli space but in all cases it was more profusely deposited in the epithelial cells. Other than the large deposits of hemosiderin, there was no significant change in the spleen and adrenals.

An extensive and detailed study of the tissue cellular changes found in this disease has been made by Hjärre.[1] He showed that the liver necrosis is a secondary symptom of the hemolysis. By injecting into guinea pigs serum containing specific hemolysins or hemolyzed blood, intralobular necrosis identical with that observed in parturient hemoglobinemia could be reproduced. Necrosis was more marked when the liver was first functionally overexerted.

The altered erythrocytes or their stroma remnants, and not the hemoglobin, were found to incite the necrosis by collecting in clumps in the liver capillaries where they disturbed circulation. The same type of necrosis also could be produced by injecting lycopodium, India ink, olive oil or liquid paraffin into the mesentery vein of guinea pigs. Emboli were found which produced multiple infarcts. He gave reasons to show that the fatty infiltration of the liver and kidneys is partly the result of hemolysis and partly due to more or less common physiological changes which take place during the puerperal period and which are especially evident in high producers. The ketonuria and high lipoid content of the blood he related to physiological change rather than hemolysis. The leukocytosia was believed to be related to circulatory disorders of the spleen and possibly other blood-forming organs, which in turn resulted from hemolysis.

Hjärre's experiments show that the lesions produced are largely the result of hemolysis and are not due to the agent causing the hemolysis, thus indicating that the primary pathology is not in the liver or kidneys but in the elements of the blood.

URINE EXAMINATION

As mentioned before, the urine is usually highly colored with hemoglobin. During the second to fourth day there may be much sediment in the form of stroma remnants of destroyed erythrocytes. Complete red cells are not found in the urine, as is reported in the case of the "hematuria type of red-water" occurring in Washington and British Columbia. The color of the urine in the early stage of parturient hemo-

globinemia is more or less distinctly red, later a port-wine color, and still later a black-coffee color.

The specific gravity of the urine during the course of the disease is somewhat lowered. Determinations of 16 individuals taken at intervals during 15 days following first symptoms (total of 39 determinations) showed a range in specific gravity of 1.015 to 1.039 with a mean of 1.025. Dukes[12] gives the normal range as 1.030 to 1.045, with a mean of 1.032.

The reaction is alkaline and is within the normal range. Thirty-two determinations range from pH 7.7 to 8.9, with a mean of 8.2.

During the period of hemoglobinuria there is, of course, a high protein content. Seven determinations from the first and second days of sickness showed an average of 12.24 grams per liter. Thirteen determinations on the third and fourth days showed an average of 5.42 grams per liter and nine determinations on the fifth and sixth days showed an average of 2.48 grams. Determinations on later days showed only traces of protein.

Benedicts' test for reducing sugars in the urine was variable in 14 animals studied. Five cases showed positive tests, although not consistently, some tests being positive one day and negative the next. One case showed 5.4 grams of reducing sugar per liter. Nine cases were negative or at times showed only traces of reducing substances. It is not uncommon, however, to obtain a strong Benedicts' reaction for reducing substances in the urine of apparently healthy cows in high production.

Acetone is not an uncommon constituent of the urine of affected cows. Of 16 cases, six proved to have appreciable quantities of acetone present, while ten did not. It is known, however, that an increase of acetone bodies in apparently healthy cows is the usual finding for a period following parturition and is especially noticeable in the heavy producers. In one affected cow the authors found that urine acetone varied between 3.18 and 0.11 grams per liter over a period of 19 days following first symptoms. The mean of the 16 samples collected from this cow was 0.90 grams.

Meigs *et al*[13] found that urinary excretion of phosphorus was influenced by some factor connected with the acid-base equilibrium of the body. The present authors found in their work with parturient hemoglobinemia that the acid-base balance was not disturbed, as shown by the CO_2 capacity (table 2). The urine from cows visibly ill with the disease contained only traces of phosphorus.

BLOOD EXAMINATIONS

Cellular Elements: Mention has already been made of the pronounced red-cell destruction. Just how long this continues before disease symptoms are manifested probably varies in different cases. It probably precedes symptoms for a longer period than would ordinarily be expected. In one case which began to show a reduction in red-cell count immediately following calving, hemoglobin-tinged plasma did not occur until 15 days later. The more acute cases probably progress more rapidly in cell destruction. Table II shows that the lowest mean erythrocyte count is reached between four and nine days following the first symptoms, after which there is a gradual increase, until the normal count is reached in two or three months. Animals placed on a heavy grain ration seemed to improve in blood count more rapidly than when the ration was left unchanged. One cow which was continued on alfalfa and beet pulp had a red-cell count of 4,500,000, three months after the sickness. One cow on the fourth and fifth days of illness had a count of 960,000 and 980,000, respectively, and recovered. The red-cell count in most affected cows is decreased to 1,500,000 before there is any increase (table II).

Erythrocytes appeared swollen and were dimpled in the centers. A basic stippling of the erythrocytes was observed which was first manifested from the fifth to ninth days following first symptoms, continuing for about five days.

Measurements on the mean volume of red cells in ten cases showed them to be

greatly increased in size when compared with that of 16 healthy, high-producing cows. The following average indices were calculated from 10 cases of hemoglobinemia ranging in time from the first to the ninth day after symptoms were first noticed: volume index 1.77, color index 1.19, saturation index 0.70, or in other words, the mean volume of the erythrocytes in the ten cases of hemoglobinemia was 77 per cent greater than the "normal" standard; the erythrocytes had on the average 19 per cent more hemoglobin than the "normal" because of their increased size, but in terms of unit size the erythrocytes had 30 per cent less hemoglobin than "normal" erythrocytes.

There was a pronounced increase in leukocytes which reached its height in three to five days after first symptoms (table II). A normal level usually was reached in 15 days after first symptoms. One cow which recovered retained a leukocyte count above 19,000 per cmm. for 8 days, the peak being 25,000 on the fifth day of illness. Differential blood counts showed a great increase of neutrophils with a corresponding decrease in percentage of lymphocytes and eosinophiles. Normoblasts also were increased for a period of about 15 days.

Plasma Elements: During the stages of pronounced erythrocyte destruction, the blood plasma was tinged with free hemo-

TABLE II—Cellular and chemical changes of the blood of cows affected with parturient hemoglobinemia.

Days After First Symptoms	Cases	Mean Erythrocyte Count (Millions per cmm.)	Cases	Mean Leukocyte Count (Millions per cmm.)	Cases	Mean Hemoglobin (gm./100 cc.)	Cases	Mean Serum Calcium (mg./100 cc.)	Cases	Mean Plasma Inorganic Phosphorus (mg./100 cc.)	Cases	Mean CO_2 Capacity (Vol. %)
						Cases not treated with Na_2HPO_4*						
1	1	3.20	0		1	5.0	1	10.6	1	1.25		
2	10	3.32	7	11,200	7	6.2	5	10.7	9	0.82	2	47.8
3	6	2.30	6	14,400	6	3.9	6	10.0	3	0.59	3	48.8
4	7	1.79	6	13,200	6	4.4	5	10.3	4	0.63	—	—
5	7	2.02	6	15,600	7	3.5	6	10.0	4	0.65	3	62.8
6–7	6	1.59	6	11,300	6	3.3	4	11.0	3	0.94	4	61.1
8–9	5	1.46	4	9,700	4	3.4	2	10.3	4	1.30	—	—
10–12	5	1.97	5	10,600	5	4.2	4	10.2	3	1.12	2	55.2
13–15	7	2.54	6	7,000	6	5.3	6	10.2	3	1.27	1	63.0
16–18	4	3.29	4	4,400	4	7.3	3	9.0	3	1.14	—	—
20–25	7	3.87	6	5,400	5	7.6	4	12.2	2	2.06	2	60.9
26–35	6	4.78	4	5,500	4	8.4	4	11.7	2	1.42	1	57.2
36–60	5	5.10	4	6,300	4	8.3	3	10.8	1	1.59	1	65.0
61–120	6	5.79	5	6,700	6	9.6	6	11.1	3	2.13	1	69.0
						Cases treated with Na_2HPO_4						
1	2	3.42	1	10,400	2	5.9	1	10.9	2	0.49	2	60.1
2	2	2.75	1	18,850	1	4.1	1	10.9	2	1.18	2	56.0
3	3	2.22	0	—	1	3.6	1	10.8	3	2.06	1	60.0
4	5	1.55	1	12,400	1	3.7	1	9.9	5	1.90	2	63.4
5	4	1.28	1	15,150	1	3.2	1	10.0	4	3.98	2	62.5
6–7	7	1.45	0	—	2	4.1	3	10.1	7	3.42	3	64.9
8–9	2	1.90	0	—	0	—	0	—	2	4.78	0	—
10–12	2	2.75	0	—	1	4.3	2	11.2	2	5.76	1	62.0
13–15	3	3.19	0	—	2	6.4	2	12.0	3	3.24	1	62.0
16–18	2	3.29	0	—	1	4.3	0	—	2	3.13	0	—
20–25	2	4.31	0	—	1	7.4	1	10.8	2	4.57	0	—
26–35	2	4.93	0	—	0	—	0	—	1	3.00	0	—
36–60	1	5.20	0	—	1	10.2	0	—	2	6.12	0	—
61–112	0	—	0	—	0	—	0	—	0	—	0	—

*The cases receiving intravenous treatment with sodium phosphate are separated in this table because of the effect such treatment would have on mean plasma inorganic phosphorus.

globin. The acetone bodies in one case increased from 6.45 mg./100 cc. on the second day of illness to 50.34 mg./100 cc. on the seventh day. This was one of the most pronounced cases of acetonemia observed. Blood glucose was commonly increased. Analyses of six cases varied between 42.3 and 79.6, with a mean of 63.5 mg./100 cc.

The CO_2 capacity (table II) was as a rule, within normal limits, although there was some tendency for slightly lower values in the early stages. In only two cases, one of which succumbed, did it fall as low as 40 per cent by volume. The Van den Bergh test for bilirubin was always strongly positive during the period of active hemolysis and a few days thereafter.

Determinations made on numerous cases for calcium (table II) revealed that this element was present in practically normal amounts, there being only a slight tendency to subnormal values.

The inorganic phosphorus values of the blood plasma, however, were so low as to warrant considerable study as to their significance (table II). The values were lowest at the inception of the disease, some being as low as 0.22 mg./100 cc. when first noted. There was a tendency for the phosphorus values to increase soon following the first symptoms. In the few cases contacted early in the inception of the disease (stage of disease shown by a relatively high red-cell count), the inorganic phosphorus was always 0.40 mg./100 cc., or below. Serial determinations on such animals have shown a slight but gradual increase of phosphorus during the acute stage of the sickness and during convalescence.

In table II the case which is listed as "first day following symptoms" in all probability had been in progress for some time, as judged by subsequent red-cell counts. Furthermore, this was a mild case, the cell count not dropping below 3,200,000. Therefore, the relatively high phosphorus value in this instance should be regarded in the light of this additional history. A cow which showed a phosphorus value of 0.22 mg./100 cc. at the same time had a red-cell count of 4,480,000. Six days later the red cell count was 1,350,000, while the phosphorus value was 9.61. Another case having a red-cell count of 4,650,000 and a phosphorus value of 0.31, four days later had a red-cell count of 1,430,000 and a phosphorus value of 8.53. The tremendous increase of phosphorus in these cases, however, was due to phosphorus medication. Experience, therefore, suggests that phosphorus values in the incipient stages of the disease may be lower than any which we have recorded.

Fish[14] found that there was a decrease of 25.5 per cent in inorganic blood phosphorus in normal cows shortly following calving and that in cows suffering with milk fever, there was an additional 38 per cent decrease. The evidence indicated that the phosphate metabolism of the body was more labile or sensitive to the activity of the mammary gland than was calcium. Fish also found that the blood phosphates reached their normal level much more rapidly than did calcium, as a result of udder inflation.

Rees and Hale,[15] in studying anaplasmosis which is characterized by pronounced destruction of erythrocytes, found that the values for inorganic phosphorus in the blood were slightly decreased but continued within the normal range. It is concluded, therefore that hypophosphatemia in parturient hemoglobinemia is not likely to be the result of intense erythrocyte destruction. Huffman,[16] who has conducted extensive experiments in connection with phosphorus requirements for dairy cows, has not, to his knowledge, observed parturient hemoglobinemia. He reported, however, that one animal whose plasma inorganic phosphorus was below 0.2 mg./100 cc. plasma showed a hemoglobin value of 20 per cent. Although no red-colored urine was noted, this could easily have been overlooked. It is known also that in some cases of the disease, red-colored urine apparently does not occur. These factors may account partly for the infrequency of reports of this disease by investigators.

Further data are needed regarding the relationship of inorganic phosphorus to

red-cell count in adequately nourished cows and in cows receiving rations low in phosphorus. This should be obtained for the various periods of lactation.

STUDIES ON ETIOLOGY

In connection with etiological investigations, a number of authors were quoted by Hjärre[1] as believing that the disease was the result of a puerperal infection with hemolytic streptococci. After a study of a number of cases bacteriologically, Hjärre[1] concluded that the disease was not infectious and that various organisms isolated from the tissues of affected animals were secondary, or contaminants.

In the present study, bacteriological examination and injection of guinea pigs and rabbits were carried out in connection with the tissues obtained from five cases which terminated fatally. Urine and blood drawn from several affected cows also were subjected to bacteriological study. Examinations of urine were negative for *Corynebacterium renalis*. Various organisms found in the urine were considered non-pathogens. In three cases a Gram-negative, spore-bearing rod was observed on cultures prepared from the blood, but later experience led to the belief that it was a contaminant. Two cows (one fresh eight weeks and the other 3 days prior to freshening) were injected intravenously with 12 cc. of defibrinated blood, obtained from a cow sick four days with parturient hemoglobinemia. No symptoms of blood changes indicating hemoglobinemia developed. A series of guinea pigs and rabbits injected with material from four cases did not become ill.

Gastrointestinal hemolytic toxemia has been suggested as a cause of parturient hemoglobinemia. The authors removed the intestinal contents from a fatal case and subjected them to a series of filtrations. Injection of the final filtrate into rabbits failed to demonstrate the presence of toxin.

Studies on the relationship of parturient hemoglobinemia to aphosphorosis, and treatment with sodium phosphate intravenously and phosphorus supplements *per os*, will be reported in another paper.

SUMMARY AND CONCLUSIONS

1. Parturient hemoglobinemia was found to be a disease of high-producing dairy cows, occurring two to three weeks following calving and characterized by hydremia, oligocythemia, icterus and usually hemoglobinuria.

2. The disease usually occurs in the stable season only and attacks cows giving birth to the third to sixth calf. It is more prevalent on certain farms than others, and there is some tendency toward recurrence in the same animal. The incidence of the disease appears to be increasing.

3. Bacteriological and protozoölogical examinations were negative and the disease could not be transmitted by inoculations. No enterotoxins could be demonstrated.

4. In Europe the disease is restricted to infertile farms and is more prevalent following a drouth. In Utah and Idaho it occurs most commonly when cows are fed rations including sugar-beet by-products.

5. The blood plasma of affected cows was found to be extremely low in inorganic phosphorus.

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Results of Vaccination with Brucella Abortus Strain 19 in an Infected Herd*

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THE PURPOSE of this paper is to report a continuation of the favorable results from the use of living *Brucella abortus* vaccine made from U. S. bureau of animal industry strain 19, when used on heifers in an infected dairy herd at San Quentin prison. A preliminary report on this herd was published in 1938.[1]

In 1933 several cases of undulant fever occurred among officials and inmates who drank raw milk from the prison herd of 43 cows. Inoculations of milk into guinea pigs showed a number of infected animals which were shedding *Br. abortus*. Two years previous there had been 50 cows in the milk herd, but the number of live calves born and raised had not been sufficient to maintain the herd at that level.

The prison officials decided to pasteurize all milk, and to try to build up a herd free from Bang's disease by vaccinating all unbred heifers then on the farm, and thereafter to vaccinate all calves. The old cows were to be left unvaccinated, and were to be kept as long as their economic usefulness continued. No new cows or heifers have been introduced into the premises since that time. As vaccinated heifers have come into production, they have been placed in the milking herd with the old cows, with no attempt to protect them from infection.

OLD, UNVACCINATED COWS

The 43 cows in the original herd in 1933 included 19 with blood agglutination titres of 1:100 or over, of which 13 were proved to be shedders of *Br. abortus*. These old cows have been gradually eliminated as their usefulness has ceased, until in December, 1938, only ten remained, eight of which were negative to the agglutination test, while one had a titre of over 1:25, and one showed a titre of over 1:400. Since 1933 this latter animal (No. 12) has yielded *Br. abortus* in her milk at 13 different dates, the last of which was at calving on August 1, 1938, and the organism was found in only one quarter of her udder. Should it be desired to dispose of this animal, it is probable that the young, vaccinated animals on the premises would no longer have a source of exposure to *Br. abortus*.

There has been no indication that the vaccine organism has been transmitted to any of the old, nonvaccinated cows, although immediately after vaccination the heifers have frequently been pastured with the older cows which were soon to calve.

YOUNG, VACCINATED ANIMALS

Vaccinations of all heifers and calves were started in September, 1933. To date, a total of 112 have been vaccinated, the majority of them between the ages of four and twelve months. However, when vaccinations were begun, 17 unbred heifers between twelve and 32 months of age also were given the full vaccine dose (200 billion), and the high agglutination titres caused by vaccinating such mature heifers persisted in many cases for two or three years. The titres of all of these older heifers had dropped to below 1:25 at the end of four years, except that of cow 65, which was probably infected before vaccination, as indicated by repeated tests with titres of over 1:50 before injection of the vaccine. Except for these cases, no significant persistence of agglutination titres has occured among the vaccinated animals.

Seventy-one of the vaccinated animals

*Although this paper was listed on the program of the New York meeting of the Association, because of lack of time it was not presented. Dr. Haring, however, did give an extemporaneous talk on the main points of the article.

This study was supported in part by grants from the U. S. bureau of animal industry. The culture used in the trials was *Br. abortus* strain 19, furnished the writer by the bureau in 1932.

have now completed one or more gestations, with a total of 146 normal calves, five abortions, and five stillbirths. It is believed that Brucella infection was not responsible for any of these abortions or stillbirths. Routine inoculations of guinea pigs with milk and vaginal swabbings have been made at practically all parturitions, and also milk has been inoculated at various other times. A total of 355 guinea pig inoculations have proved to be negative for *Br. abortus*.

The only isolations of the organism from vaccinated animals are as follows:

Cow 65: This heifer showed titres of over 1:50 at four blood tests preceding vaccination at the age of 24 months. She has since completed five gestations, all ending in normal calves, and her titre is now between 1:25 and 1:50. During her second and third gestations, virulent *Br. abortus* (not strain 19) was isolated at five different times from guinea pigs inoculated with her milk, while inoculations of vaginal swabs at her second and third calvings were negative. Subsequently, 17 inoculations of milk (or vaginal swabs at calvings) have all been negative.

Cow 94: This heifer showed no agglutination titre one month after vaccination at the age of four months and since her blood has always been completely negative. She has completed two gestations, both with normal calves. *Br. abortus* (not strain 19) was isolated from a guinea pig inoculated with a vaginal swab taken at the time of her first calving. Ten subsequent inoculations of milk or swabs have all been negative, indicating that whatever infection existed in this cow was not sufficient to cause either an abortion, shedder conditions, or the development of agglutinins in the blood serum.

The five abortions and the five stillbirths among the vaccinated cows can not be attributed to infection with *Br. abortus*, since inoculations of the cows' excretions into guinea pigs have failed to show the organism, and the blood tests have been either completely negative or with only a low residual vaccination titre.

A number of the heifers were bred in pasture for their first pregnancies. Excluding these, it has required an average of 1.9 breedings to establish the pregnancies which have been completed. However, during 1938 a number of animals, mostly heifers, required from three to six or more breedings, and some of these may not yet be pregnant. New bulls were put into service, and the breeding difficulty may be due to their partial impotency rather than to the heifers.

At the last blood test of the herd in December, 1938, there were 51 vaccinated animals which had calved one or more times. Of these, only one showed a titre of over 1:50. The agglutination-test history of this cow shows a gradual decline in titre since the high point soon after vaccination at the age of eleven months, and it probably will eventually become negative. Titres between 1:25 and 1:50 were shown by twelve of the vaccinated cows, and the remaining 38 had tests which were either completely negative or with only incomplete agglutination in the 1:25 dilution.

Twenty-seven animals which were vaccinated either have died or been killed, ten before calving for the first time. The reasons for the deaths are classified as follows: nine because or sterility or nymphomania; 13 because of injuries, tumors, and bloating; and five because of poor production, poor condition, or miscellaneous reasons.

SUMMARY

Brucella abortus, U. S. bureau of animal industry strain 19, has been used since 1933 in vaccinating all heifers born into a prison herd in California. As these heifers came into production, they were placed with the old, nonvaccinated cows, many of which were proved to be shedders of *Br. abortus*. As the utility of the old cows has decreased, they have been gradually eliminated, until now only ten are left, one of which was still shedding *Br. abortus* in 1938.

No cows or heifers have been brought into the herd from the outside. The vaccinated animals now in milk production total 51, or 19 per cent more than the total number in the old, infected herd in 1933.

The vaccinated cows have produced 146 normal calves. There have been five abortions and five stillbirths among vaccinated cows, but inoculations and blood tests indicate that these were not caused by *Br. abortus*.

Br. abortus of virulent type (not strain 19) was isolated from two of the vaccinated cows, neither of which aborted, and one of which had a titre of over 1:50 when vaccinated at the age of 24 months. Continued recent tests have failed to demonstrate the organism in the milk or vagina of these two cows.

There is no evidence that the vaccine organism was transmitted to any of the old, nonvaccinated cows in the herd by association with the vaccinated heifers.

When vaccinations were begun, 17 unbred heifers between twelve and 32 months of age were given full vaccine doses, and the vaccination titres of some of these animals did not recede to below 1:25 for about four years. No significant persistence of titres has occurred in the balance of the heifers vaccinated between four and twelve months of age.

ACKNOWLEDGMENT

The author is grateful to Mrs. Phyllis Zweigart, agent of the U. S. bureau of animal industry, and Mr. G. E. Dean for valuable assistance in this work. Caretakers for experiment animals and laboratory aid were furnished by the Works Progress Administration, approved project No. 465-03-3-210.

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The spermatozoa of mammals is most active at a temperature of 37° to 40° C. Temperatures of 46° to 50° C. rapidly destroy them. At 25° C. spermatozoa retain their vitality and their motility. Their vitality and motility may, however, be maintained for a long time even at a temperature of 0°.

Studies of the Mechanism of Immunity in Tuberculosis*

The fate of bacilli of reinfection at the portal of entry and in metastic foci, and also the associated host responses, are essentially similar in rabbits and guinea pigs. In the guinea pig tubercle bacilli of reinfection are more effectively fixed at the portal of entry than in the rabbit. The guinea pig also fixes unrelated substances such as trypan blue and agar particles at the site of injection more effectively than the rabbit.

At the site of a local, nonspecific inflammation, precipitins from the circulating blood accumulate in higher concentrations in tuberculous guinea pigs than in tuberculous rabbits. These different fixing capacities of the two species are associated with differences of extracellular character in the inflammation resulting from reinfection. In rabbits and guinea pigs primarily infected, the destruction of tubercle bacilli takes place first and most extensively at the portal of entry. At this time they are less effectively destroyed in the nearest metastatic foci. The cell-free body fluids of normal animals support the growth of tubercle bacilli *in vivo*. The body fluids of tuberculous animals under the same conditions are bacteriostatic for this microörganism. Tubercle bacilli often multiply by preliminary subdivision into non-acid-fast granules from which the acid-fast rods sprout.

*The rôle of extracellular factors and local immunity in the fixation and inhibition of growth of tubercle bacilli. Max B. Lurie. Jour. Exp. Med., lxix (1939). p. 555.

Vaccination will aid materially in controlling avian variola, but as in the case of other virus contagions, it does not equally prevent the bacillary complications —roup, coryza, etc. The proper time to vaccinate is at the age of eight to twelve weeks. Vaccination too early or too late causes a more severe reaction and delayed recovery from the reaction.

Johne's Disease Infection of Laboratory Animals with Aid of Paraffin Oil

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OVER a period of years this laboratory has carried on various experiments designed to infect different species of animals with Johne's disease, or paratuberculosis. Animals such as cattle and sheep have been infected in every attempt by drenching or by force feeding with virulent liquid cultures of *Mycobacterium paratuberculosis* organisms or groundup intestines taken from cattle immediately after their death from Johne's disease.

Since the high infectivity of the cultures of this organism for both cattle and sheep had been proved, it was decided to attempt again to infect small laboratory animals, such as guinea pigs and rabbits, using large doses of the causal organism, notwithstanding that all our previous efforts to do so had proved unsuccessful. Likewise, in the initial attempts to infect these small animals by using as inoculants emulsions of the *M. paratuberculosis* organism in physiological salt solution, as well as in distilled water, it was impossible to reproduce the disease or even to demonstrate microscopically any acid-fast organisms in smears prepared from the organs of these animals four months after their exposure, when they were chloroformed for examination. The method of exposure adopted was either force feeding or inoculation subcutaneously or intraperitoneally with a one-month-old culture of *M. paratuberculosis*.

During the past few years we have maintained a small herd of cattle infected with Johne's disease for testing the potency of each lot of Bureau-produced johnin, intended for diagnostic purposes or other experimental study. Guinea pigs inoculated with avian tuberculosis also were used for testing the value of johnin in such instances, but the results obtained with these animals were not altogether satisfactory. Because of these results it was decided to try other procedures in order to produce Johne's disease in guinea pigs and, if successful, to use the latter for testing the potency of johnin. Moreover, about this time we were planning to prepare a vaccine for use on young calves in herds where the disease was prevalent. It was thought best to begin this work with guinea pigs rather than large animals.

Before proceeding with any of the latter experiments, it was considered desirable to be able to produce the death of the guinea pigs with Johne's disease in a much shorter period of time than would be the case with the larger animals. In view of these points, the desirability of incorporating a virulent culture of the *M. paratuberculosis* with paraffin oil, which would act as a depot for the organisms, suggested itself. It was thought that, at the time these organisms were injected into an animal, they would probable adhere to the globules of oil and thus become attached to the various organs instead of being eliminated from the system, as had been the case when saline solution or distilled water had been employed. Therefore, a retarded absorption with the production of lesions might follow.

At the beginning of these experiments, guinea pigs of no certain weight were utilized for the inoculations. A one-month-old culture of *M. paratuberculosis*, which at the time had covered the surface of the synthetic medium and was still in a rapid process of growth, was used as an inoculant.

PREPARATION OF THE INOCULANT

The flasks in which this organism had been growing were removed from the incubator and the contents poured into paper filters placed in sterile funnels. The resi-

due of *M. paratuberculosis* organisms remaining on the paper filters was scraped off and placed in a sterile mortar, covered by cheesecloth previously treated with bichloride of mercury solution through which a sterile pestle had been inserted. The organisms in the mortar were then ground thoroughly, or until the material assumed a creamy consistency. One part of the organisms so prepared and two parts of a previously Berkefeld-filtered paraffin oil were then placed in a sterile bottle, which was placed on a shaking machine for at least 15 minutes, or until the organisms were thoroughly emulsified with the oil. Of many such preparations made, no separation of the emulsion has been noted at any time, and it has always been possible to use a small gauge needle for inoculation of the material.

GUINEA PIG INOCULATIONS

Beginning our first experiment with this emulsion of *M. paratuberculosis* and paraffin oil, we inoculated seven normal guinea pigs directly into the peritoneal cavity. The dosage was 2 cc. As a result, all of the guinea pigs died in seven to 32 days after inoculation. Postmortem examinations demonstrated small foci and nodules of various sizes on the surface of the liver, spleen, lungs and diaphragm, with enlargement of some of the lymph glands (fig. 1). These nodules were circumscribed and pearl-grey, adhering to the serous membranes in the animals which died early, but in those animals surviving the longest period it was noticed that the lesions had penetrated more deeply into the affected organs. (See figure 2.)

Proceeding with these experiments, we found it possible again to produce the same character of lesions in both guinea pigs and rabbits by inoculating these animals with an emulsion of the lesions from affected organs, such as the spleen, liver, kidneys, lungs and lymph glands, made up with paraffin oil or even normal physiological saline solution. As already stated, saline emulsons containing the *M. paratuberculosis* had heretofore failed to show any evidence of Johne's diseases in either guinea pigs or rabbits, but after only one passage through guinea pigs it appeared that the virulence of this organism had been increased markedly.

Although it is possible to produce typical lesions and death at various periods after inoculation, it has been noted that some guinea pigs are not as susceptible as others, and a certain percentage of these

Fig. 1. Enlargement and caseation of cervical lymph glands of a guinea pig affected with Johne's disease (actual size).

animals have remained alive for four to five months before succumbing to this disease.

In one case, a female inoculated intraperitoneally was bred two months after the inoculation. This animal appeared to be in excellent condition and gave birth to six young. Four of these were chloroformed immediately after birth and examined for lesions. The results were negative but microscopic examination of smears made

directly from the liver demonstrated acid-fast organisms morphologically typical of the *M. paratuberculosis*.

Two cc. of an emulsion of the livers from these animals in paraffin oil was inoculated subcutaneously and intraperitoneally into eight half-grown guinea pigs. Six of the inoculated animals died within a period of six weeks and macroscopic examination demonstrated typical lesions in the spleen, liver, intestine and adjacent lymph glands. These animals had a marked diarrhea and were in a state of emaciation at death.

The two remaining pigs died at the third and sixth week, respectively, but an examination of the animals was not made, since the deaths were not reported until after extensive decomposition had occurred.

Numerous strains of the *M. paratuberculosis* were used in this work. Among those were nine cultures which had been obtained from Holland, England, Canada, and from reactor cattle in several states in this country, all of which were used for infectivity tests on guinea pigs, with positive results. The lesions noted in these animals on postmortem examination were identical in character and there was only the usual variance, as already mentioned, in the time of death of these inoculated animals.

With this evidence at hand, it was decided to vaccinate 30 guinea pigs, using as the vaccine (1) one part of *M. paratuberculosis*, exposed in an Arnold sterilzer to a temperature of 100° C. for three hours, and (2) one part of normal horse serum, mixed with one part of 0.5 per cent sodium carbonate solution to prevent coagulation, and heated at 100° C. for half an hour.

Varying amounts of the vaccine in 1, 2 and 3 cc. doses were used in the test on guinea pigs. After 17 days had elapsed a virulent culture of *M. paratuberculosis* was used intraperitoneally for the exposure of these animals. The same dosage was then given intraperitoneally to a similar number of control guinea pigs.

At the conclusion of this experiment it was noted that a majority of the vaccinated animals had died, showing lesions of Johne's disease before the control animals had succumbed. It was evident that the vaccinated animals had become more susceptible to the disease.

The fact above mentioned that attempts to immunize laboratory animals by injection with heat-killed cultures of *M. paratuberculosis* suspended in sterile, normal horse serum and equal parts of 0.5 per cent sodium carbonate have proved unsuccessful has been recorded previously in the *Report of the Chief of the Bureau of Animal Industry* for the fiscal year ended June 30, 1938, page 65.

Since the present experiments were begun, we have inoculated such animals as rabbits, mice and rats, all of which have shown the same type of lesions on postmortem examination as those noted in the guinea pigs. Mice are apparently quite susceptible to this organism, as they die in nine to 24 days after inoculation.

INOCULATIONS OF CHICKENS AND PIGEONS

Chickens and pigeons also were inoculated in the same manner, using 2 cc. of oil emulsions of both cultures and the affected tissues from guinea pigs which had succumbed to the disease. The chickens failed to exhibit any external signs of infection. However, the intradermic johnin test produced a positive reaction when applied to the wattle. Postmortem examination of these birds conducted five months after inoculation, revealed pin-point lesions on the liver and spleen, somewhat similar to lesions of avian tuberculosis. Microscopic examination of smears taken from the liver demonstrated numerous acid-fast organisms in small clumps and nests, which are typical of the causative organism of Johne's disease. Tests with avian tuberculosis, when applied to the wattles of these birds, were negative.

Of four pigeons inoculated intraperitoneally with 2 cc. of a culture of *M. paratuberculosis* in paraffin oil, one died on the 28th day and was quite emaciated when autopsied, but failed to reveal any macroscopic lesions in the various organs. However, microscopic examination of smears prepared from the liver, spleen and intestine demonstrated the *M. paratuberculosis*.

The remaining three pigeons were chloroformed 134 days later and showed large, cheesy areas involving entire lobes of the liver in two cases, similar deep caseous areas in the pectoral muscles and an abdominal exudate that caused the matting together of a number of intestinal loops. In fact, it was remarkable that these birds were able to survive such extensive infection, although no macroscopic lesions were present in the lungs, spleen or kidneys. The affected areas were examined microscopically and numerous acid-fast organisms were noted.

OTHER INOCULATION TESTS

In a dairy herd which had several deaths over a period of the last few years, the symptoms reported were somewhat similar to those of Johne's disease, except that no emaciation was in evidence. Johnin tests failed to show any well marked reactions, but when another animal died, an autopsy was performed and portions of the intestine were obtained for sectioning and microscopic examination, with positive results.

Scrapings from the intestine also were positive when examined for acid-fast organisms. Some of these scrapings were ground up thoroughly, placed in a 30 per cent solution of antiformin for one hour in order to destroy contaminating bacteria, and then emulsified with paraffin oil.

This material, in 2 cc. doses, was then inoculated subcutaneously and intraperitoneally into guinea pigs, rabbits and chickens. Thirty days after inoculation, these animals were subjected to the intradermic tests, using mammalian and avian tuberculin and johnin. All of the animals gave negative reactions to the mammalian and avian tuberculin, but at the 48th hour after the injection of johnin, the guinea pigs and rabbits exhibited, at the seats of injection, well marked, circumscribed, slightly-raised red swellings, about the size of a half-dollar, which persisted for over 72 hours. The chickens were also positive to the wattle test with johnin but failed to react to the mammalian and avian tuberculins.

All of the guinea pigs and rabbits were dead within six weeks after being inoculated with these scrapings. Both macroscopic and microscopic examinations of the lesions observed in the organs proved them to be typical of Johne's disease.

In our experience thus far, the results of the inoculation tests applied to laboratory animals, as well as the intradermic johnin test applied to these smaller animals, have confirmed the findings from microscopic examination of smear preparations from suspected bovine intestines in a majority of cases. The laboratory animals which react to this test after previous inoculations usually lose weight rapidly, become emaciated as the result of a progressive diarrhea, and die within three to six days thereafter.

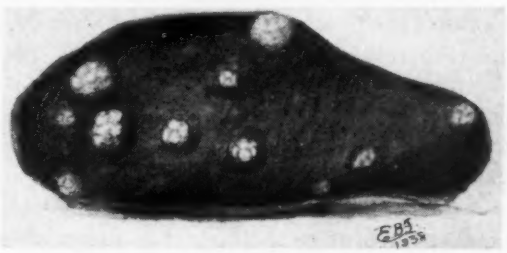

Fig. 2. Spleen of guinea pig, showing caseous nodules containing M. paratuberculosis (actual size).

In a herd of goats where the disease had been suspected, it was possible to produce typical lesions in guinea pigs within seven weeks by inoculating the antiformin-treated feces in combination with paraffin oil. The amount of the inoculant given to each guinea pig was 4 cc., since only two pellets of feces were emulsified and only a small number of organisms were demonstrated microscopically in this material.

Smears of whole blood drawn directly from the heart of two infected guinea pigs, just before death but after intradermic tests had been applied with positive results, showed acid-fast organisms upon microscopic examination of stained specimens.

From the observations herein reported, it seems logical to conclude that the paraffin

oil acts as a culture medium in which the organisms multiply until they overcome the normal tissue resistance.

SUMMARY AND CONCLUSIONS

As a result of the above experiments, it may be stated that when cultures or tissues containing *Mycobacterium paratuberculosis* are emulsified with paraffin oil and then inoculated into guinea pigs, the animals usually develop symptoms of disease within two or three weeks and succumb, as a rule, in 30 to 90 days, although some may linger as long as five months.

In previous experiments these laboratory animals had always proved refractory to inoculations with either saline or distilled water suspensions of material containing *M. paratuberculosis.*

Therefore, in paraffin oil we have a new tool or vehicle which, when mixed with *M. paratuberculosis,* is highly capable of infecting laboratory animals, either by reducing their resistance or by increasing the antigenic property or the virulence of the causal organism.

The economic advantage of using the smaller laboratory animals for diagnostic purposes is self-evident.

While guinea pigs, rabbits, rats, mice and pigeons have been proved to be quite susceptible to the artificial method of infection above described, chickens are more difficult to infect, although pin-point lesions of the disease were observed on the liver and spleen when the birds were chloroformed five months after inoculations.

As a rule, guinea pigs and rabbits develop lesions which consist of small (0.1 to 0.4 of a centimeter) grayish-white foci scattered over the serous membranes of the peritoneal and thoracic cavities. In a few instances the lesions remained localized at the seat of inoculation, while in others they extended beneath the capsule of the liver and other viscera, involving the deeper portions of the organs. These various lesions revealed numerous *M. paratuberculosis* organisms.

The Cure and Cause of "Running Fits"

A REMEDY for another erstwhile incurable affliction of animals was added to the memorable cures of recent years when Patton in his East Lansing laboratory discovered that the spasmophilic disease of dogs we know best as fright disease or running fits is an avitaminosis pure and simple, and that it yields promptly to the administration of thiamin hydrochloride (vitamin B_1). According to a report published in *Veterinary Medicine* for June, 1939, this puzzling affliction of the central nervous system can be produced with mathematical precision by vitamin B_1 depletion, and then cured with equal regularity by restoring the deficiency.

The thiamin hydrochloride treatment is equally effective in both experimentally and naturally induced cases, says the author* who gives the readers of veterinary literature a classical recital of his brilliant achievement. The discovery which has already attracted nationwide attention in the public press is a victory belonging exclusively to the veterinary profession—to an incessant worker in the field of animal nutrition.

Assuming that the treatment will stand up under the critical tests of the clinic, thiamin hydrochloride takes its place among the other spectacular cures of grave diseases which have come rapidly into the practice of veterinary medicine, namely calcium gluconate of Greig for milk fever, sulfanilamide of Domagk for streptococcemia, and nicotinic acid of Elvehjem for blacktongue. These are a quartette of cures credited to chemistry in medicine.

Obviously, Patton's achievement, which seems to bear the closest investigation, will have a far-reaching effect on the present conception of functional cataclysms of the nervous system in man and animals.

*J. W. Patton, Fright Disease an Avitaminosis, Veterinary Medicine, xxxiv (June, 1939), pp. 372-381.

The reason we are headed for war is that there has always been a war just ahead since David swung his slingshot, and before.

The Blood Picture of Young, Normal Dogs*

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IN CONNECTION with experimental studies on the changes in the blood picture in hookworm disease of dogs (Landsberg 1937, 1938), an opportunity was presented to observe the complete hematological picture in young, normal dogs. A survey of the literature revealed that, with several exceptions, the blood studies on normal dogs have been confined to mature animals. Furthermore, in none of the published reports on young animals are there given values for the newer hematological constants, namely, the mean corpuscular volume, the mean corpuscular hemoglobin and the mean corpuscular hemoglobin concentration. In view of these facts it is the objective of the present study to give, as adequately as feasible, the complete hematological findings in young, normal, male and female dogs.

EXPERIMENTAL PROCEDURES

For this study groups of litter-mate, male and female mongrel dogs, ranging from four to nine animals in each group, were utilized. These animals were bred in the laboratory or purchased in litters, in the vicinity of Baltimore, Md., about the time of weaning. In all instances, however, the animals were allowed to become acclimated to the laboratory diet, usually for a period of four weeks, and were worm-free (by the Lane floatation technic) at the time the blood samples were taken. At least two samples were studied on each animal within a period of several days and the mean of these taken as the representative value.

The blood samples were obtained by cardiac puncture, using a clean dry syringe (10 cc. capacity) fitted with a Luer needle (about 18 gauge). A volume of 3 cc. of blood was drawn and put into bottles (capacity, about 6 cc.) containing a dry mixture of potassium oxalate (four parts) and ammonium oxalate (six parts). A concentration of 2 mg. per cc. blood of this anticoagulant, according to Heller and Paul (1934), produces no change in the erythrocyte volume.

From the sample thus obtained the total number of erythrocytes per cmm. was determined, using a Thoma pipette and a Levy counting chamber (both certified by the U. S. Bureau of Standards). The diluent, Rees and Ecker platelet solution, was utilized in order that the platelets could be enumerated concomitantly with the erythrocytes. The hemoglobin concentration, in grams per 100 cc. of whole blood, was determined by the Newcomer hemoglobinometer. The volume of packed red cells was obtained by the use of the Wintrobe hematocrit (1929), with centrifugation at 3,000 revolutions per minute for 30 minutes. In calculating the derived corpuscular constants of the erythrocyte, namely, the mean corpuscular volume (C.V.), the mean corpuscular hemoglobin (C.H.) and the mean corpuscular hemoglobin concentration (C.C.) the formulae proposed by Wintrobe (1932) were employed.

From this same sample the total white cell count was made. Aside from using a Thoma white cell pipette and Türck's solution as a diluent, the same procedure was employed as that utilized for the erythrocytes.

The blood smears for the differential leukocyte counts were made directly from the needle tip immediately following the cardiac puncture. These smears were made on coverslips and stained with Wright's stain. Usually 200 white cells in consecutive fields were counted and the percentage estimated.

The reticulocyte preparations were made by the so-called "wet method." The blood

*From the Department of Helminthology, School of Hygiene and Public Health, the Johns Hopkins University, Baltimore, Md. This work was made possible through a grant from the International Health Division of the Rockefeller Foundation.

was taken from the needle tip or from the marginal ear vein. A small drop was placed on a 22 mm. square, chemically clean coverslip. To the drop of blood was added a drop of reticulocyte dye* and the two thoroughly mixed. The coverslip was inverted over a clean glass slide and the edges ringed with vaseline to prevent drying. After 15 minutes, the number of reticulocytes were counted in a total of 500 erythrocytes, with 1.9 mm. objective and 10 x occular.

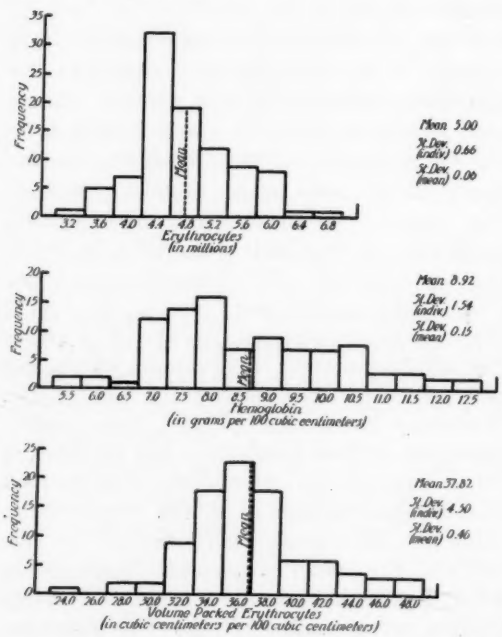

Fig. 1. Frequency distribution of erythrocyte counts, hemoglobin and volume of packed red cells in 95 normal dogs.

EXPERIMENTAL RESULTS

The 95 animals (38 male and 57 female) studied ranged from 38 to 212 days old, but most of them were between three and four months old, the average age being 102 days. The weight range was 1.6 to 8.6 kilos but most of them were between 3 and 5 kilos, the average being 4.5. Since there was no evidence of an age or weight influence on the blood picture within this group, no analysis of the data according to these factors will be included, but will be presented separately for the two sexes.

*Dye composed of approximately 1 per cent brilliant cresyl blue in physiological saline.

Erythrocytes: The determined erythrocyte values are based upon a total of 238 individual determinations on 38 male and 57 female animals. The mean erythrocyte count for the combined groups was 5.004 million per cmm., the hemoglobin 8.92 gm. per 100 cc. of blood and 37.82 cc. volume of packed red cells for 100 cc. blood. The values for the individual groups along with their standard deviations are given in table 1 and the frequency distribution for these values is given in figure 1. When the mean erythrocyte counts for the male and female groups were compared it was observed that the counts were higher in the female group. Upon statistical analysis this difference was found to be significant as the value of the difference divided by the σ difference is 2.19. The hemoglobin concentration was found also to be higher in females and, when compared with the male group, is almost statistically significant, as the value for difference divided by the σ difference is 1.43σ. In comparing the volume of packed red cells the value for the female group was found to be higher than the male and this difference is statistically significant, as the value for σ is 2.91.

The derived erythrocyte constants, the mean corpuscular constants, calculated by the formula of Wintrobe, are based upon the same number of determinations as are the observed ones. For the combined groups the mean corpuscular volume averaged 76.31 $c\mu$, the mean corpuscular hemoglobin 18.64 micromicrograms and the mean corpuscular hemoglobin concentration 24.36 per cent. A statistical comparison of these mean values shows no significant difference between the male and female groups. The values for the individual groups as well as the standard deviation are given in table 2 and frequency polygons showing the distribution, in figure 2.

To facilitate comparison with other studies, the class units and frequencies upon which the polygons were constructed, for both the observed and derived erythrocyte values, are shown in table 3.

Reticulocytes: To determine the average

TABLE I—The mean value and standard deviation for the erythrocytes, hemoglobin and volume of packed erythrocytes for 38 male and 57 female, young, normal dogs.

	Erythrocytes (in Millions)			Hemoglobin (Grams per 100 cc.)			Volume Packed Erythrocytes (cc. per 100 cc.)		
	Males	Females	Males and Females	Males	Females	Males and Females	Males	Females	Males and Females
Mean	4.810	5.119	5.004	8.68	9.14	8.92	36.31	38.82	37.82
St. Dev. (individ.)	0.596	0.768	0.668	1.35	1.81	1.54	3.62	4.76	4.50
St. Dev. (mean)	0.098	0.102	0.068	0.22	0.24	0.15	0.59	0.63	0.46

number of reticulocytes, 133 determinations were carried out on 45 male and female animals. Since there were no significant statistical differences between the two sexes, the value for the combined group is given. The mean was found to be 1.36 per cent with standard deviation of the individual of 1 per cent and a standard deviation of the mean of 0.15 per cent.

Total Leukocyte Count: The total number of leukocytes was determined on a total of 81 animals, comprising 33 males and 48 females. There was in all a total of 216 leukocyte counts made on these dogs. Upon statistical analysis it was found that no significant differences existed between the counts for the male and female groups. Therefore, the values presented here are based upon the combined group. The mean total leukocyte was found to be 11,895 leukocytes per cmm., with a standard deviation of the individual of 2,600 and a standard deviation of the mean of 288. The frequency distribution in the form of a polygon is given in figure 3.

Differential Leukocyte Count: A differential leukocyte count was made on the same animals at the same time that the total white cell count was done. As in the case of the total leukocyte values, there was no evidence of any sex influence on the differential leukocyte counts. The average and the extreme values are given in table 4. It should be noted that both young and adult lymphocytes are included under the single heading, Lymphocytes, in the tabulation.

Thrombocytes: The thrombocytes (blood platelets) were enumerated on 82 normal male and female animals. The mean value is based upon 214 individual determinations. Since the number is not significantly different for the two sexes, the mean value was established on the combined groups. The mean count was 154,879 per cmm. with a standard deviation of the individual of 33,070 and a standard deviation of the mean 3,670. The distribution is

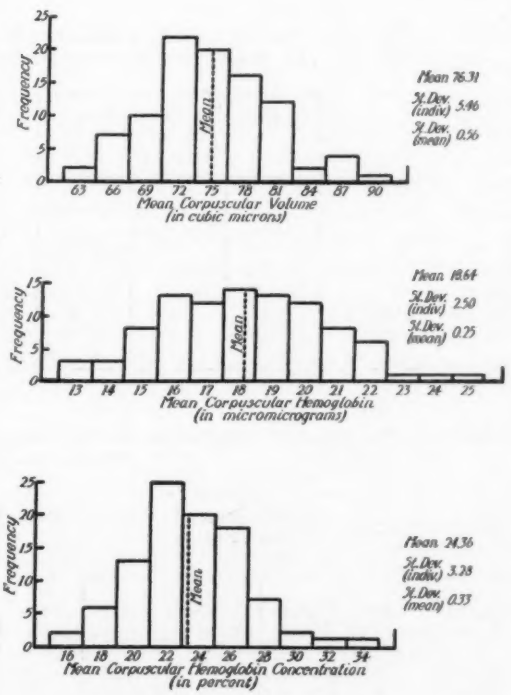

Fig. 2. Frequency distribution of the mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration in 95 normal dogs.

shown in the frequency polygons given in figure 4.

DISCUSSION

Scarborough (1926), in his compilation of the published blood values for normal dogs, remarks that the erythrocyte values are lower in immature animals and that they increase gradually with age. Wells and Sutton (1915), as well as Powers, Bowie and Howard (1930), expressed the same idea. The present values are somewhat higher than those reported for very young dogs (one to 16 days) by Wells and Sutton (*loc. cit.*) but fall well within the range for puppies given by Downey (1938). They are, however, somewhat lower than the average count given for young dogs by Burnett (1917). Comparison of these values with the findings of twelve reports on the blood picture in adult animals showed that the number of erythrocytes, the concentration of hemoglobin and the volume of packed red cells were lower in the present group.

The calculated corpuscular constants for the young animals given in this study vary from the published reports. Wintrobe, Shumacker and Schmidt (1935) in their report on the blood picture in normal dogs include a table (page 505) giving the published values for these constants. A comparison of the values obtained in this study for young dogs with those published by

TABLE II—The mean value and standard deviation for the mean corpuscular volume, the mean corpuscular hemoglobin and the mean hemoglobin concentration for 38 male and 57 female, young, normal dogs.

	Mean Corpuscular Volume (Cu. μ)			Mean Corpuscular Hemoglobin (Micromicrograms)			Mean Corpuscular Hemoglobin Concentration (Per Cent)		
	Males	Females	Males and Females	Males	Females	Males and Females	Males	Females	Males and Females
Mean	76.02	76.50	76.31	18.84	18.51	18.64	24.63	24.20	24.36
St. Dev (individ.)	5.43	5.58	5.46	2.73	2.32	2.50	3.54	3.04	3.28
St. Dev. (mean)	0.89	0.74	0.56	0.44	0.31	0.25	0.58	0.40	0.33

TABLE III—The frequency distributions for the determined and derived erythrocyte values on 95 male and female, young, normal dogs.

Erythrocytes (Millions)		Hemoglobin (Grams per 100 cc.)		Vol. Packed R. B. C. (cc. per 100 cc.)		Mean Corp. Vol. (Cu. μ)		Mean Corp. Hb. (Micromicrograms)		Mean Corp. Hb. Conc. (Per Cent)	
Class Unit	Frequency	Class Unit	Frequency	Class Unit	Frequency	Class Unit	Frequency	Class Unit	Frequency	Class Unit	Frequency
3.2–3.5	1	5.5– 5.9	2	24.0–25.9	1	63.0–65.9	2	13.0–13.9	3	16.0–17.9	2
3.6–3.9	5	6.0– 6.4	2	26.0–27.9	2	66.0–68.9	7	14.0–14.9	3	18.0–19.9	6
4.0–4.3	7	6.5– 6.9	1	28.0–29.9	0	69.0–71.9	10	15.0–15.9	8	20.0–21.9	13
4.4–4.7	32	7.0– 7.4	12	30.0–31.9	2	72.0–74.9	22	16.0–16.9	13	22.0–23.9	25
4.8–5.1	19	7.5– 7.9	14	32.0–33.9	9	75.0–77.9	20	17.0–17.9	12	24.0–25.9	20
5.2–5.5	12	8.0– 8.4	16	34.0–35.9	18	78.0–80.9	16	18.0–18.9	14	26.0–27.9	18
5.6–5.9	9	8.5– 8.9	7	36.0–37.9	23	81.0–83.9	11	19.0–19.9	13	28.0–29.9	7
6.0–6.3	8	9.0– 9.4	9	38.0–39.9	18	84.0–86.9	2	20.0–20.9	12	30.0–31.9	2
6.4–6.7	1	9.5– 9.9	7	40.0–41.9	6	87.0–89.9	4	21.0–21.9	8	32.0–33.9	1
6.8–7.1	1	10.0–10.4	7	42.0–43.9	6	90.0–92.9	1	22.0–22.9	6	34.0–35.9	1
		10.5–10.9	8	44.0–45.9	4			23.0–23.9	1		
		11.0–11.4	3	46.0–47.9	3			24.0–24.9	1		
		11.5–11.9	3	48.0–49.9	3			25.0–25.9	1		
		12.0–12.4	2								
		12.5–12.9	2								

Wintrobe *et al* for mature ones, reveals that for young canines the mean corpuscular volume is greater, the mean corpuscular hemoglobin and the mean corpuscular hemoglobin concentration, lower.

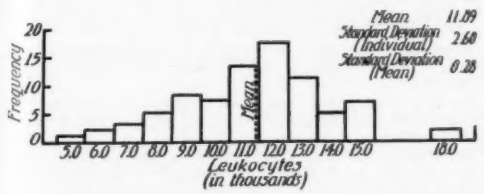

Fig. 3. Frequency distribution of the total leukocyte counts on 81 normal dogs.

In the present study it was observed that the mean values for the number of erythrocytes, the concentration of hemoglobin and the volume of packed erythrocytes were higher in the female group than in the male. Kuhl (1919), according to Scarborough (1926), also found higher erythrocyte counts in female canines and Mayerson (1930) reports similar findings for the erythrocytes, hemoglobin and hematocrit values. There are, however, reports in the literature (Scarborough, 1926; Wintrobe *et al*, 1935) in which the erythrocyte values for the male group are higher than those for the female group.

The percentage of reticulocytes found in the present study agrees fairly well with the figure of 0 to 1.4 per cent given by Musser and Krumbhaar (cited by Scarborough, 1926). The mean percentage (1.36 per cent) reported here also is close to that (1.85 per cent) reported by Mayerson (1930) but is somewhat higher than the average of 0.6 per cent found by Krumbhaar (Scarborough, 1926).

The range of the total leukocyte count for the young animals of this study agrees with the range for young dogs given by Wells and Sutton (*loc. cit.*). The average leukocyte count in this series is just a little higher than that given for adult dogs by Downey (1938) and agrees rather closely with the figure for adult animals given by Mayerson (1930). The differential leukocyte count observed in the present studies agrees fairly well with that published for adult animals. Considering the small differences between the total and differential leukocyte counts in young and adult animals, one may question whether the leukocytes do vary with age.

The average number of thrombocytes found in these animals is lower than that reported by other investigators (Loesch *et al*, 1924; Kruger and Schultz, 1925; Mayerson, 1930; Scarborough, 1930) for normal animals, but higher than that by Klieneberger (1927). Judging from the erythrocyte values, which in some instances were given concomitantly with the thrombocyte counts, the values reported in the literature were determined upon animals older than those utilized in the present study. Aside from this fact there is no other ready explanation, except differences in technic, to account for this discrepancy.

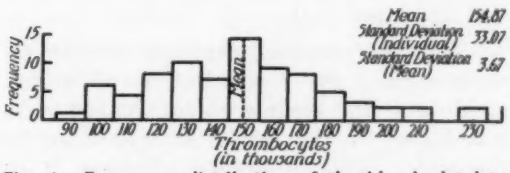

Fig. 4. Frequency distribution of the blood platelets in 82 normal dogs.

TABLE IV—The average differential leukocyte count, along with the minimum and maximum counts on 33 male and 48 female young, normal dogs.

	Percentage		
	Minimum	Maximum	Average
Myelocytes	0	7.5	1.30
Metamyelocyte ("Juvenile" form)	0.6	11.0	4.37
Polymorphonuclear neutrophile	47.5	74.5	63.61
Eosinophile	0	5.5	1.81
Basophile	0	0.5	0.03
Lymphocytes	16.0	43.5	28.13
Monocytes	0	2.6	0.70

Summary and Conclusions

1. Some data on the blood picture of young, normal, male and female dogs are presented.

2. The mean age for 95 animals was 102 days and the mean weight was 4.5 kilos.

3. The 95 animals had a mean erythrocyte count of 5.004 million per cmm., a mean hemoglobin of 8.92 gm. per 100 cc. and a volume of packed erythrocytes of 37.82 cc. per 100 cc.

4. The corpuscular constants on these 95 animals were as follows: mean corpuscular volume 76.31 cμ; mean corpuscular hemoglobin 18.64 micromicrograms and the mean corpuscular hemoglobin concentration 24.36 per cent.

5. It was observed that the number of erythrocytes, the concentration of hemoglobin and the volume of packed red cells was higher in the female animals than in the male. This difference, although it is not in agreement with all previous reports, was tested statistically and found to be significant.

6. The mean reticulocyte count on 45 male and female animals was 1.36 per cent.

7. The mean total leukocyte count on 81 male and female animals was 11,895 cells per cmm. There was no significant difference between the two sexes.

8. The average differential leukocyte count on these 81 animals was as follows: 1.30 per cent myelocytes, 4.37 per cent metamyelocytes, 63.61 per cent polymorphonuclear neutrophiles, 1.81 per cent eosinophiles, 0.03 per cent basophiles, 28.13 per cent lymphocytes and 0.70 per cent monocytes.

9. The mean thrombocyte count on 82 male and female animals was 154,879 per cmm. There was no significant difference between the sexes.

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Anemia and Worms

The theory that blood-sucking worms cause anemia by consuming the blood of the host is debatable since degrees of blood impoverishment may precede, exist with, or succeed the helminthiasis, and furthermore anemia may be associated with cestodes, trematodes and other non-blood-sucking worm parasites. To the argument that anemia may function as a cause of worm parasitisms rather than merely being an effect, add the never-failing ability of the healthy body to replenish blood losses however produced.

Tests for Avitaminoses

It is no longer necessary to guess whether vitamin A deficiency exists. With the biophotometer vitamin-A-deficient blood can be detected immediately. The test is based upon the relation of vitamin A to regeneration of the visual purple of the eye. This test should settle the uncertainty about the alleged relation of periodic ophthalmia and avitaminosis A.

The Shute test[1] for vitamin E, which is a delicate serological test, is another new method of removing uncertainty from a controversial question. Then there is the intradermal, dichlorophenol indophenol[2] test (also called the Tillman test) for vitamin C, which is capable of settling the dispute over the need of this factor in certain animals.

[1]Editorial, Jour. A. V. M. A., xciv (Apr., 1939), p. 424.

[2]C. Gregorie: La Vitamine C. Annales de Médecine Vétérinaire, August-September, 1938, pp. 366-377, and British Med. Jour., Feb. 12, 1938.

Studies on Trichinosis. IX. The Part of the Veterinary Profession in the Control of Human Trichinosis*

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THERE IS every indication that we have in the United States a higher incidence of trichina infestation in man than any other country in the world, and, as a corollary, probably the greatest problem in human trichinosis in the world.

Interest in this problem has increased greatly during the past few years. A number of factors may be responsible for this increased interest, among them being a greater number of scientific workers engaged in trichinosis investigations, with a larger number of papers appearing in medical, veterinary and other scientific journals; an increase in the number of states requiring reports of cases of trichinosis, with a consequent increase in the number of cases reported; the introduction of the intradermal and precipitin tests as aids in diagnosis; and more accurate diagnoses on the part of physicians, resulting in the detection of more cases. It is difficult to evaluate any of these factors but, nevertheless, the fact remains that public health officials, physicians and interested persons in other groups are aroused over the magnitude of the problem and for the first time in half a century are beginning to seek control measures more definite than those operative at the present time.

The fact that human trichinosis rests almost entirely on the basis of swine trichinosis renders the control of the former not only a problem for public health officials and the medical profession in general, but also calls for the coöperation of the swine grower, the meat packer, the live stock sanitary official and the veterinarian. In fact, the part which these latter groups of individuals can play in any effort to control human trichinosis is as important as is the part to be played by those individuals more directly concerned with the problem of public health. It is particularly fitting, therefore, that we consider at this time the relation of the veterinarian and the veterinary profession to the general problem of trichinosis control.

Past and Present Status of Swine Trichinosis

Sixty-three years ago, Dr. George Sutton,[1] a practicing physician of Aurora, Ind., presented before a meeting of the Indiana State Medical Society a paper which was remarkable in that it brought out the keenness of the author's insight into the trichinosis problem and the wealth of experimental data which he had collected at a period only 14 years after Zenker had demonstrated trichinosis to be a disease entity. With exceptional patience and tenacity, Sutton had examined with his crude microscope samples of muscle from 1,000 hogs raised in Dearborn county, Ind., and found 9.6 per cent of these hogs to be trichinous. As a result of these findings, Sutton observed:

> From microscopical examinations of pork brought to my office by our farmers for examination during the past year, we have become satisfied that a large portion of the hogs of our country are affected with this parasite. I think it highly probable that when the fact becomes more generally known, that so large a per cent of the pork is affected with trichinae and capable of producing so loathesome a disease as trichinosis, it will have an influence upon the sale of one of the principal productions of the West, affecting the agriculturalist and even, to some extent, the commerce of our country.

Fortunately for a growing swine industry, Sutton's prophecy remained unfulfilled. We hope that it will never be fulfilled. How-

*Presented at the 45th annual meeting of the Virginia State Veterinary Medical Association, Roanoke, June 30 to July 1, 1938.

ever, this expressed threat still hangs over the swine industry. This is largely a result of the wilful violation of sanitary principles by a relatively few individuals having no direct relationship to the great majority of swine growers who raise swine in a clean, sanitary and thoroughly acceptable manner.

In addition to Sutton's observations, there was available as long as 50 years ago abundant evidence concerning the high incidence of trichinae in swine. For instance, Mark[2] in 1889 found an incidence of 17.98 per cent of trichinae in offal-fed swine at Boston, Mass., and Calvin[3] in 1890 reported incidences of 8.33 to 10 per cent in offal-fed swine in Iowa. It is probable that Sutton's survey included many offal-fed swine, his results thus corresponding to the results obtained by Mark and by Calvin. As we shall see, the single improvement in the situation as related to swine trichinosis has been brought about through discontinuance of the feeding of slaughter house offal to swine, since today we do not encounter the high trichina incidences previously encountered in swine of this class. This improvement, however, has been brought about merely as a result of general advances in sanitation and not with the particular object of controlling trichinosis.

Ranking below offal-fed swine, we find that swine fed on uncooked garbage show the next highest incidences of trichina infestation. Hall[4] in 1935 reported an incidence of 4.8 per cent in garbage-fed hogs, while Schwartz[5] found an incidence of 4.41 per cent of trichina infestation in samples from 6,684 hogs fed on uncooked garbage. Schwartz reported also on the examination of 1,987 hogs known to have been fed on cooked garbage, of which only 11, or 0.55 per cent, were found to be infested.

Numerous examinations of grain-fed hogs for trichinae have indicated that the incidence of the parasite in this class is between 1 and 2 per cent. Most recent figures are those of Hall,[4] who reported an incidence of 1.5 per cent, and those of Schwartz,[5] who reported an incidence of 0.91 per cent in 6,692 hogs. Schwartz's data apparently include results of examinations reported previously by Hall.

Southern swine should probably be regarded as a type separate and distinct from those types mentioned previously. Southern swine ordinarily have the run of fields and woods quite apart from distinct pasture confinement. Hogs produced under these conditions seldom have access to table scraps or kitchen swill, which to a certain extent probably enter into the feed consumed by so-called grain-fed hogs. All recorded examinations of southern swine indicate that animals raised under the conditions outlined have a very low incidence of trichina infestation, probably about 0.5 per cent.

In reviewing these data, it will be seen than the offal-fed hog is infested with trichinae more frequently than any other, but it is no longer a factor of any importance in the production of human trichinosis, since the practice of feeding offal to swine has been largely discontinued. Next in importance as a factor in the spread of trichinae to man is the hog fed on uncooked garbage. The evidence for the relatively high incidences of trichinae in these swine is well established and thoroughly convincing. That the cooking of garbage is a potent safeguard in the prevention of swine trichinosis is evidenced by Schwartz's findings of only about one-tenth the incidence of trichinae in swine fed on cooked garbage as compared to the incidence in those fed on raw garbage.

That the grain-fed hog does not constitute a group *per se* is indicated by a trichina incidence of 1 to 2 per cent in swine of this group. If these so-called grain-fed hogs had been fed on grain exclusively, it is apparent that their trichina infestation would have been derived from rats or through rare cases of cannibalism. While hogs do eat rats and rarely carcasses of other hogs, these occurrences are not of sufficient frequency to account for the incidences of trichinae found in swine of this group. The unavoidable conclusion is that many of these so-called grain-fed hogs have had access to raw or undercooked pork scraps in garbage, table scraps or swill from the farm kitchen.

Southern swine, comprising usually those having the run of fields and woods and not usually confined to pastures within easy access or close proximity to the farm swill barrel, and having a relatively low incidence of trichinae, may be regarded as a relatively infrequent source of human trichinosis.

To crystallize the thought of our thesis, we may say that southern swine and swine fed on cooked garbage rank in the lowest order of importance as sources of human trichinosis; so-called grain-fed hogs are two to three times more important; garbage-fed hogs approximately 10 times more important; and the rare-existent offal-fed hog 20 to 30 times more important. Any plan designed for the control of human trichinosis must take into consideration these rather well established facts, and in a sense these facts permit of a certain precision in the elaboration of any such plan.

PAST AND PRESENT STATUS OF HUMAN TRICHINOSIS

If we are to base our appraisal of the prevalence of human trichinosis on the number of reported cases of the disease, we are apt to arrive at an entirely erroneous impression. Emphasis has been placed by some on the fact that during the past 96 years only some 5,000 to 6,000 cases of human trichinosis have been reported in this country, and the inference has been drawn from these figures that trichinosis is not a public health problem. These figures are preposterously low and are grossly misleading.

Hall[6] has summarized from the literature over 50 different conditions with which trichinosis has been confused, and a diagnosis of one or more of these conditions has been made in cases of trichinosis. It must be remembered that trichinosis is not a disease characterized usually by pathognomonic symptoms. Many cases of trichinosis present symptoms simulating other conditions, and mistakes in diagnosis are easily made because of the lack of uniformity in the manifestations of the disease. In a recent outbreak comprising 25 cases of trichinosis, the majority of the cases were diagnosed as influenza, grippe or sinusitis before the condition was finally recognized.

Furthermore, it must be kept in mind that trichinosis has been and, even today, is regarded by many persons as a rare condition and a disease associated almost exclusively with racial groups such as Germans and Italians, who commonly eat certain types of pork products without cooking. It is true that Hall,[7] in examining the epidemiological aspects of trichinosis, as based on 1,000 diaphragm examinations, did find the incidence of trichina infestation to be higher among Germans and Italians than among native English-Scotch-Irish stocks. However, over 80 per cent of the cases positive for trichinae were among the native American population, indicating that trichina infestation in this country is not confined to any particular racial group.

From necropsy studies we can arrive at a much clearer interpretation of the extent of trichina infestation, even though we can not determine accurately by such methods the actual number of cases of human trichinosis.

Sawitz[8] has recently summarized necropsy findings of trichinae in man in this country. Since Whelpley in 1891 conducted the first examinations, a total of 2,922 cases have been examined, exclusive of examinations in the National Institute of Health and examinations reported by Simonds, who apparently made no special search for trichinae, of which 367, or 12.56 per cent, were positive for trichinae. In our own series, Nolan and Bozicevich[9] have reported on a total of 1,000 examinations, of which 17.4 per cent were positive for trichinae. Since the report of these workers, our examinations have reached a total number of 2,485, of which 428, or 17.25 per cent, were positive for trichinae.

The discrepancy in the results obtained by other workers and those obtained in the National Institute of Health may be accounted for by the fact that we have examined our necropsy material by two methods, the direct microscopic and the digestion-Baermann methods, whereas other workers, for the most part, used only one method of

examination. Our data indicate that either method, when used alone, will disclose only about two-thirds of the positive cases. If we make allowance for this correction figure in considering the 2,922 cases reported by others, instead of 12.56 per cent positives, we have 16.7 per cent positives, or a figure corresponding closely to our findings of 17.25 per cent. If these findings can be taken as significant, and we believe they are significant, approximately one person of every six examined in the United States is infested with trichinae.

Certain persons, skeptical of a conclusion such as the one above-mentioned, have questioned the validity of results derived from surveys of this sort. These persons point out the great preponderance of hospitalized cases in these surveys, believing that hospitalization might have been influenced by a previous trichina infestation. The criticism has been made also that the cases examined have not been selected on the basis of a strictly random sampling; and it has been held that the examination of a mere few thousand cases does not give results which can be applied categorically to a population of 130,000,000.

It must be recognized that all of these criticisms have a certain cogency. Sawitz[10] supplied a partial answer to them when he examined at New Orleans 200 necropsy cases for trichinae, and skin-tested 200 individuals at random with trichina antigen. Five per cent of the 200 necropsy cases showed a trichina infestation, while 5 per cent of the 200 skin-tested individuals reacted positively. Thus did Sawitz demonstrate the validity of his results from necropsy examinations for trichinae.

In our laboratory we are now gathering data which we believe will in a great measure answer further the above-mentioned criticisms and will add confirmation to our thesis.

It has been said that findings of the sort pointed out are of greater interest from the zoölogical and statistical standpoints than from the standpoint of public health. We can not concur in any such assertion. Until facts are known relative to the incidence of clinical trichinosis, such statements are misleading, and tend to obscure the issue and to minimize the importance of the trichinosis problem in the same manner that it has been minimized over the past 50 years.

It is true that our information on the prevalence of clinical trichinosis is fragmentary. We do not know the degree of trichina infestation, as expressed in terms of larvae per gram of muscle, which will result in clinical symptoms of the disease. Information on this point is being gathered as rapidly as possible. The work of Ferenbaugh, Segal and Schulze[11] indicates that an infestation as low as eight larvae per gram of muscle will produce clinical symptoms of the disease. However, this degree of infestation is probably not sufficient to produce regularly symptoms of trichinosis.

A breakdown of the data on larvae per gram of diaphragm muscle in our necropsy cases indicates that 86.1 per cent of the positive cases had infestations of less than eleven larvae per gram. However, 2.6 per cent had infestations of 101 to 1,000 larvae per gram, infestations of a degree which would probably produce clinical symptoms of disease. Applying this percentage figure to the present population, we would have several hundred thousand persons who have been ill at some time or other with clinical trichinosis. These figures represent merely the roughest sort of an estimate and can have no validity until we have much more information. However, they are sufficient to indicate that the total of 5,000 to 6,000 cases of clinical trichinosis reported in the literature for the last 96 years is not representative of the trichinosis problem.

THE PROBLEM OF TRICHINOSIS CONTROL

We have reviewed briefly the present status of swine trichinosis and human trichinosis and believe that we have marshalled evidence sufficient to support our contention that the disease is a significant public health problem. From the facts presented we may well ask ourselves whether we are not now at the crossroads in dealing with

this disease. We have the choice of continuing with a policy which is only temporizing and which leads nowhere as far as control is concerned, or of inaugurating and pursuing a plan of attack through which we may eventually arrive at some measure of control.

Assuming that something can be done and will be done about the trichinosis problem, it is pertinent that we review briefly the procedures available to us, pointing out the advantages and disadvantages of these various lines of action.

1. We might inaugurate an intensive campaign of publicity and thus sound a general alarm, warning the public that one in every six persons is probably infested with trichinae, that trichinosis is rife, that pork is dangerous and that illness lurks in this important item in the diet of most of our people. Considering that the federal bureau of animal industry and other agencies have for years been utilizing nearly every available means to warn the public to cook pork well, and that no appreciable results have come from these warnings, it does not appear that a continuation or extension of wide publicity will be of any more value than formerly. It seems that the use of such measures would be not only a futile gesture toward control but might work incalculable harm to the swine grower and the meat-packing industry. It is evident that a certain portion of the American public prefers rare pork, just as it prefers rare beef, and it will probably continue to indulge in its tastes regardless of warnings to the contrary.

2. We might demand the microscopic inspection of all pork for trichinae, a measure which would probably result in a fairly adequate control of the disease, as it has in Germany. Such inspection, however, would not eliminate trichinosis entirely, for the reason that it would not detect all infested hogs. Unless such inspection were applied to all pork produced in this country, and not merely to federally inspected pork, it would fail in its objective and give a false sense of security to the consumer, who frequently does not know the source of pork purchased for home consumption or of that eaten elsewhere. A measure of this sort would require a small army of inspectors at a cost probably exceeding that of the present federal meat-inspection service, and would slow up packing-house operations, thus adding materially to the cost of packing and marketing.

3. We might demand the refrigeration of all pork for 20 days at 5° F. to destroy trichinae. This would be an effective control measure but would require immense refrigerating facilities, at a cost which would be prohibitive, and, like microscopic inspection, would no doubt add considerably to the price to the consumer.

4. We might demand that the packing industry refuse to purchase swine fed on uncooked garbage, or purchase them at a price sufficiently low to allow for the cost of refrigerating or processing to destroy the trichinae. Assuming that some method can be worked out for identifying swine fed on uncooked garbage, this measure would no doubt be of considerable value in the control of the disease. Although the organized packers may become sufficiently interested to consider such a plan, the application of the measure would not entirely solve the problem.

Provided such a plan could be set in motion, we would still have the problem of supervising the refrigeration or processing of pork in plants not under federal inspection. Since there is little inspection comparable to federal inspection for approximately one-third of the meat produced in this country, garbage-fed hogs would no doubt find their way into noninspected plants, thus nullifying to a considerable extent the benefits from a plan of this sort.

5. In contrast to the unwarranted, costly or inopportune possibilities of action already reviewed, we still have available an entirely feasible and workable plan of control. Since the hog fed on uncooked garbage is the most important factor in the spread of trichinae to man, any initial steps in the control of human trichinosis should be toward the elimination of the major source of swine trichinosis, either by keeping uncooked pork scraps out of the feed of swine, or by cooking garbage before feeding it to swine.

The control of garbage feeding is not a matter which falls within the scope of any federal agency and, consequently, can not be regulated by government decree. Federal agencies, such as the Public Health Service and the bureau of animal industry, can act in a coördinating and advisory capacity, but a plan of this sort calls for the combined coöperation of all interested individuals and agencies. Before any restrictions are placed on garbage feeding, those engaged in the practice should be given the opportunity of voluntarily instituting corrective measures. In the case of those who do not coöperate voluntarily, other steps should be taken.

The situation calls for state laws or regulations to be administered under the state board of health or the state live stock sanitary board. Such laws or regulations should provide for the licensing of garbage-feeding plants, for the cooking of garbage for a period of time sufficient to destroy all trichinae, and for the supervision of such plants by the proper agency. Licenses should be granted to established plants that represent a considerable investment but should be refused for new ventures and for small-scale garbage feeders, who have little financial stake involved and would suffer little or no financial loss if forced to discontinue the practice.

This is a bare outline of the first steps which can be taken under existing conditions to control human trichinosis. Details can be worked out to meet local conditions. Present laws and regulations in some states may be sufficient to provide adequate authority for a program of action; in other states, it may be necessary to ask for suitable legislation. Regardless of existing authority, it is time that something be done to remedy present conditions and some definite program of action be instituted as an initial step in the control of human trichinosis.

THE VETERINARY PROFESSION AND TRICHINOSIS CONTROL

As far as can be seen, the veterinary profession owes little or nothing to the garbage-feeding industry as compared to its debt to the swine industry. The practice of feeding uncooked garbage to swine has helped to perpetuate many of those animal diseases which the veterinary profession has been endeavoring for half a century or more to control or eradicate. There is no reason to believe, therefore, that the veterinarian will hesitate to coöperate in any movement to control the feeding of uncooked garbage to swine, particularly when such a movement is of direct benefit not only to public health but to the swine industry in general, an industry from which the veterinarian derives part of his income. The profession should therefore cooperate wholeheartedly in any movement for the control of the disease. Some of the ways in which such coöperation can be exercised are reviewed briefly, as follows:

1. Veterinarians should actively support, as individuals or as organized groups, any movement on the part of state boards of health or state live stock sanitary boards for the control of garbage-feeding plants and for the proper cooking of garbage before feeding it to swine, as an aid in the prevention and control of hog cholera, foot-and-mouth disease, tuberculosis, swine trichinosis and human trichinosis.

2. Veterinarians can endeavor to educate garbage feeders concerning hazards to public health from swine fed on uncooked garbage; advise compliance with any and all local and state sanitary laws and regulations applying to garbage-feeding plants; and encourage voluntary action on their part. Self-imposed reforms within an industry are better in the long run than restrictive legislation providing compulsory reforms.

3. In cities and towns contracting for garbage disposal with firms or individuals who, in turn, feed such garbage to swine, veterinarians may point out the public health hazards of such procedure and urge contractual provisions for cooking the garbage. This is a situation which exists in many American cities, a situation which makes for a continual cycle of trichina infection from swine to swine and from swine to man within a localized area, since garbage-fed hogs are usually marketed lo-

cally. Veterinarians connected with city health departments are in a position particularly advantageous for pointing out the menace to public health through such methods of garbage disposal.

4. Members of the profession should actively encourage the institution of local and state-wide inspection of meat and meat-food products not now under federal inspection, on a basis comparable with the federal system. Such inspection should be administered and carried out by a staff of qualified veterinarians free from political control and chosen on a civil service or other competitive basis, to insure an efficient personnel. This is a development which is long overdue. The attainment of such a program would add materially to the degree of protection of the public against diseases and parasites transmitted from meat-food animals.

5. Veterinarians should discourage in every way possible the feeding of kitchen scraps and swill to farm-raised swine and backyard-raised swine, as a protective measure against hog cholera and trichinosis. As pointed out previously, the feeding of kitchen swill to swine appears to be a considerable factor in maintaining swine trichinosis. This phase of the trichinosis problem will probably prove to be one of the most difficult with which to deal.

6. Members of the profession can actively promote the adoption by swine growers of the swine sanitation system developed by the federal bureau of animal industry, as a measure for more economical swine production and for disease protection against such conditions as ascariasis and certain other parasitic conditions and filth-borne diseases. Adherence to the swine sanitation system will largely prevent lungworm infestation in swine, by removal of the animals from areas in which the intermediate earthworm hosts are most prevalent. Such a system of sanitation is of double value in the control of trichinosis, since the animals are removed from barnyards and pens where rats are usually abundant, and are removed also from proximity to the farm swill barrel, thus with less opportunity for receiving kitchen scraps or swill containing scraps of raw pork.

These are a few of the more obvious ways in which the veterinary profession can take an active and effective part in any campaign to control human trichinosis. As measures for control are instituted, no doubt the veterinarian will be called upon to assume other responsibilities in the campaign.

SUMMARY

The present status of swine trichinosis is reviewed briefly and it is pointed out that southern swine and those fed on cooked garbage rank in the lowest order of importance as sources of human trichinosis; so-called grain-fed hogs are of the order of two to three times more important; hogs fed raw garbage approximately ten times more important; and the almost completely disappeared offal-fed hog, 20 to 30 times more important.

Necropsy studies carried out in the National Institute of Health and elsewhere indicate that trichina incidence in man is approximately 17 per cent, about one of every six examined in the United States being infested with trichinae. Accurate data concerning the prevalence of clinical trichinosis in man in this country are lacking, but such evidence as is available indicates that the total of 5,000 to 6,000 cases reported during the past 96 years is a preposterously low figure and one not representative of our trichinosis problem, which is probably greater than anywhere else in the world.

Possibilities of action for the control of trichinosis are reviewed. At the present time it appears that the most feasible plan is that looking to the elimination of the garbage-fed hog as a source of human trichinosis by the exercise of control over garbage-feeding plants by state boards of health or state live stock sanitary boards, through the licensing of such plants and the compulsory cooking of garbage before

Suggestions are made concerning the its consumption by swine.

(*Continued on next page*)

Propagation of the Virus of Vesicular Stomatitis in the Chick Embryo

By ERVIN A. EICHHORN, V. M. D., and CHESTER A. MANTHEI, D. V. M.

Animal Disease Station, U. S. Bureau of Animal Industry, Beltsville, Md.

THE DEVELOPMENT of new methods in the propagation of various viruses in growing chick embryos offers a new field in the study of viruses to the investigator. The difficulties encountered in the usual procedure of carrying various strains in suitable animals have in many instances been eliminated by the facility with which the egg lends itself to the propagation of various types of viruses.

Heretofore, at the Animal Disease Station, the Indiana and New Jersey types of vesicular stomatitis virus were carried in guinea pigs by inoculation of the scarified metatarsal pads with virus in the form of emulsified guinea pig pads of a previous inoculation. These pads were removed and placed in glycerine phosphate buffer solution for preservation. Virus preserved in this manner remained viable for a period of a month but rarely longer than two months.

A method for lengthening the period of viability was developed by placing the harvested guinea pig pads in a desiccator over phosphorus pentoxide and drying *in vacuo* for approximately 72 hours. Immediately following removal from the desiccator, the virus is placed in vials, sealed *in vacuo*, and held in the refrigerator until used. This method of preservation has proved the virus to be viable at the end of five months, at which time the supply of dried material was exhausted. Further experiments along this line are now being carried out and indications are that the material remains active for even a much longer period of time.

Experimental propagation of vesicular stomatitis virus in the egg was undertaken to determine the effect of the virus on developing chick embryonal tissue and its immunological behavior, and also to develop a method for obtaining more abundant amounts of virus for experimental purposes.

The first successful propagation *in vitro* of vesicular stomatitis virus was reported by Carrel, Olitsky, and Long[1] in 1928. These workers utilized embryonic guinea pig tissue or adult bone marrow which had been placed in contact with the virus in Tyrode's solution for 1½ to 24 hours. The tissue was then transferred to Carrel flasks containing coagulated plasma, to which serum was added in the case of bone marrow, or embryonic juice if embryonic tissue was used. This material was then incubated for seven to ten days.

Burnet and Galloway[2] in 1934 demonstrated that vesicular stomatitis virus will grow and multiply on the chorioallantoic membranes of developing chick embryos and will produce specific lesions in this tissue.

TECHNIC OF INOCULATION

In work done at this station, the method of inoculation of the egg is that of Burnet, with a few modifications.

(*Continued from page 607*)

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[10]Sawitz, W.: Amer. Jour. Public Health, xxvii (1937), 10, pp. 1023-1024.
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The eggs to be inoculated are first candled to determine their viability and to locate the air sac and embryo, after which a small area over each is painted with tincture of iodine. In the center of these areas an opening of approximately 2 mm. is ground through the shell, but not through the outer shell membrane, with a dental type drill. At the time of inoculation, a heavy platinum wire is heated and the membrane is punctured first at the air sac and then at the point overlying the embryo. This allows the egg contents to occupy the space of the former air sac and the chorioallantoic membrane pulls away from the inner shell membrane, forming an artificial air sac over the embryo.

Inoculation of the virus suspension is then made into this artificial air sac, following which the openings are sealed with sealing wax. Sealing wax was selected after use of various other sealing agents, such as cellulose tape, had resulted at times in contamination of the egg. The speed with which it may be applied and its sterile nature due to heating make it, in our opinion, a suitable material for this type of work.

The eggs are then placed in the incubator in a horizontal position with the artificial air sac uppermost and held at a temperature of 99.5° F. for 40 to 48 hours. In this work, the New Jersey type of virus of vesicular stomatitis was used.

Determining Most Suitable Age of Embryo

In an effort to determine the lethality of the virus, twelve- and 13-day-old embryos were inoculated with approximately 0.02 cc. of vesicular fluid from guinea pig pads inoculated 28 hours previously. These eggs were examined at 24-hour intervals until the 96th hour. All of the embryos survived the virus inoculation, and guinea pigs inoculated with the minced embryos did not become infected. Burnet and Galloway,[2] however, showed that there is evidence of a difference in the lethality of New Jersey and Indiana strains of virus. According to their findings in one experiment, the New Jersey strain killed one out of four embryos whereas the Indiana strain was lethal in four out of six. Therefore, another series of eggs was started with nine- and ten-day-old embryos. These were inoculated with vesicular fluid as before and were examined commencing with the 18th hour. In all cases, the embryos were dead between the 18th and 24th hour. This series was carried in eggs for eleven generations, but guinea pigs which had been inoculated with material from each of these egg generations proved to be completely immune in the first generation only. Fifty per cent of the animals were immune in the next three generations and all subsequent generations showed no immunity.

Period Required for Maximum Growth in the Egg

Further tests were made to determine the age of embryo most suited for the propagation of the virus. The results showed that the eleven-day-old embryo was the most suited for virus growth. The optimal time of incubation of the virus in the eleven-day-old embryo was studied.

Eleven-day-old eggs were inoculated with vesicular fluid and the embryos harvested at 24-, 48-, and 96-hour intervals and inoculated into guinea pig pads by scarification. Since all the embryos of the 24-hour-incubated virus were alive and lethal action was maximum between the 40th and 48th hours, the maximum growth of virus was indicated for this period. Guinea pigs inoculated with the 96-hour growth showed slight lesions only.

It was further determined that between the 40th and 48th hours, 48 per cent of the embryos were dead or in a weakened condition. Guinea pigs inoculated from these embryos developed a high temperature in 28 hours and showed typical lesions in 48 hours, whereas guinea pigs inoculated from apparently normal living embryos from the other inoculated eggs produced little if any temperature and very slight lesions. Optimal growth, therefore, was taken to occur after the 40th to the 48th hour of incubation.

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SERIAL PASSAGE OF THE VIRUS

In order to determine whether serial passage of the virus through many generations in the chick embryo might affect its virulence and immunological characteristics, a series of eggs was inoculated, starting with vesicular fluid from the guinea pig.

This series was carried for 26 generations before being abandoned. Each generation of eggs was inoculated with approximately 0.02 cc. of a 20 per cent suspension of embryonic tissue in sterile normal saline solution. To control the virus content, a portion of this suspension was also inoculated into guinea pig pads by scarification. In all cases the controls showed typical lesions, with three exceptions. In these, subsequent immunity was demonstrated so that these animals were either immune previous to inoculation with egg virus or received sufficient virus in low concentration to induce immunity.

It has been observed that the period of lowest virus content of the eggs, as indicated by low temperatures and more moderate lesions in the guinea pigs, as well as lowered lethality to the embryos, occurred between the third and eighth generations. This phenomenon was noted in each of the series of passages carried out with this virus.

In the propagation of the virus of equine encephalomyelitis, as reported by Beard and associates,[3] a similarity is noted. This virus shows relatively low concentration in the egg until about the fifth or sixth generation, at which time the concentration rapidly increases.

During the serial passage, it was noted that unless the virus produced its lethal effect within the 40- to 48-hour period, the antiviral activity of the embryo destroyed the virus rapidly. This fact was determined by inoculation of guinea pigs from the same generation of eggs with both the live and dead or nearly dead embryos. The guinea pigs inoculated with the live embryos showed neither systemic reactions nor local lesions, whereas those inoculated with the dead or nearly dead embryos developed typical temperatures and pad lesions.

Beginning with the ninth generation of the virus in the egg, a gradual increase in the temperatures and a decrease in the incubation time for the chick-propagated virus in the guinea pig were noted. The lesions on the pads also became much more marked and, during the latter generations of this series, became so intense that sloughing of the pads often occurred within three to four days after inoculation. This intense sloughing had never been noted before when an animal-passage virus was used. From these indications, it appeared that the virus had increased both in concentration and virulence during successive passage in the egg.

Four times during the preceding series, inoculations were made into guinea pigs from chorioallantoic membranes alone and from embryos alone. This was done in order to ascertain whether either or both tissues contained the virus. Both tissues were washed separately in sterile saline solution to avoid the possibility of transferring the virus through contact of the embryo and its membrane; each was then inoculated into guinea pig pads. In all cases, the thermal reaction and the pad lesion were equally severe in the inoculations from both the chorioallantoic membranes and the embryos. As far as has been determined, both the chorioallantoic membranes and the embryos contain the virus.

The virus does not produce marked macroscopic pathological lesions in the fetal tissues. However, engorgement, petechial hemorrhages, and moderate thickening of the chorioallantoic membrane were noted. In the affected embryos, the skin showed areas of hemorrhage which varied from small petechiae to ecchymoses. Occasionally the brain showed small hemorrhagic areas extending deeply into the brain substance.

The guinea pigs in this series were then tested, at intervals of two weeks to a month following the initial inoculation with egg virus, for immunity to the original virus which had been carried by animal passage. In all cases, complete immunity was demonstrated. Therefore, egg-propagated virus and animal-propagated virus appear

biologically identical, which is of significance from an immunological standpoint.

FILTRATION OF EGG-PROPAGATED VIRUS

To determine the filtrability of vesicular stomatitis virus, six different generations of egg-propagated virus were filtered through a Berkefeld filter of N porosity. The efficiency of the filter candles was tested by filtering a mixture of *Brucella abortus* organisms and chick-embryo emulsion. Part of the filtrate was transferred to serum-potato-agar slants and in all cases no bacterial growth was noted after 72 hours of incubation.

Seventy per cent of the guinea pigs inoculated with chick-embryo filtrate showed positive lesions and temperatures, whereas 100 per cent of the control guinea pigs inoculated with the original chick-embryo emulsion showed positive lesions and temperatures. This difference was probably due to varying amounts of albuminous material from the embryonic tissues which covered the surface of the filter candles, thus decreasing the size of the pores below that necessary for passage of the majority of virus particles. Usually most of the albumin can be taken out of the ground emulsion of chick embryos by the passage through paper pulp under negative pressure. Failure to obtain positive lesions in guinea pigs inoculated from chick-embryo filtrates in the earlier filtration experiments might have been due to the omission of the paper pulping prior to the Berkefeld filtration.

Immunity tests were run on both the filtrate- and emulsion-inoculated guinea pigs. Eighty per cent of the guinea pigs inoculated with the filtrate were proved immune to vesicular stomatitis virus. This increase of 10 per cent over the 70 per cent showing positive reactions probably was due to two guinea pigs' receiving sufficient virus in the filtrate to produce immunity without lesions. All guinea pigs inoculated with the emulsion were proved completely immune to vesicular stomatitis virus.

DISCUSSION

The propagation of vesicular stomatitis virus in both the developing chick embryo and chorioallantoic membrane is possible and enables one to obtain large amounts of virus economically. The immunological identity of egg-propagated and animal-propagated viruses indicates the possibility of producing an immunizing agent for use on susceptible animals.

The virulence is increased after the virus becomes adapted to the egg, as shown by the intensity of the lesions and high temperatures produced in guinea pigs inoculated with egg-propagated virus.

The outstanding difficulty in the propagation of vesicular stomatitis virus in the developing hen egg was to maintain viability between the fourth and eighth generations. Indications are that it is necessary for the virus to become adapted to the egg.

CONCLUSION

1. Vesicular stomatitis virus dried *in vacuo* and held in the refrigerator remains viable for at least five months.

2. Vesicular stomatitis virus (New Jersey strain) can be propagated in both the developing chick embryo and chorioallantoic membrane.

3. Eleven-day-old embryos are the most suitable, with 40 to 48 hours of incubation for maximum virus production in the egg.

4. The virulence is increased after successive passages in the chick embryo.

5. Egg-propagated virus is immunologically identical with animal-propagated virus.

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Methylene blue is an antidote for sulfanilamide intoxication.

Observations on Capillaria Contorta in Turkeys*

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IT HAS been reported that *Capillaria contorta* (Creplin) Travassos infests the mucosa and submucosa of the mouth, esophagus and crop of principally wild birds in South America, Europe, Asia and the United States. Cram[1] has given a historical review of this parasite and has indicated variations in the morphological characteristics which make *C. contorta* difficult to identify.

It appears that the first undisputable report of the parasite in this country was made by Van Roekel[2] in 1929 in California valley quail, although Rietz[3] had reported it five years previously in chickens. The latter's report was based on the finding of Capillaria eggs in the droppings and not on an actual observation of the parasite. *C. contorta* has been reported as occurring in the pheasant, quail, duck, partridge, grouse, common crow and turkey.

Fig. 1. Typical, penguin-like posture of a turkey in advanced stage of C. contorta infestation.

C. contorta is to be differentiated from *C. annulata* (Molin) Cram, which was first observed in the United States by Cram[4] in 1925, and which principally infests the esophagus and crop of pheasants and chickens, although it has been found in the turkey, grouse, quail, partridge and a few other wild birds. Wehr[5] has recently reported that the two earthworms, *Helodrilus foetidus* and *caliginosus*, may serve as intermediate hosts for this parasite, while Cram[1] has observed that *C. contorta* has a direct life cycle. The latter author also reported that diphtheric membranes characterize *C. annulata* infestation, while in *C. contorta* infestation a catarrhal inflammation with a flocculant exudate is characteristically observed. Sloughing, hemorrhage and thickening of the mucosa have also been noted.

Microscopic lesions attributable to *C. contorta* in the turkey have consisted of slight connective tissue capsule formation surrounding the parasite, areas of epithelial necrosis and infiltration by large mononuclear leukocytes and lymphocytes.

Cram[1] has been able to infest turkeys, quail and ducks experimentally but could not produce infestations in the chicken, guinea fowl, pigeon and crow. Unsegmented eggs were found in the droppings, intestinal and crop contents of the experimentally infested birds; cleavage occurred readily under favorable conditions of moisture, temperature and oxygen. The eggs of the turkey strain under those conditions contained well developed embryos in 27 to 37 days.

Observations on Three Flocks of Infested Turkeys

The literature contains but meager information relative to symptoms and treatment of *C. contorta* infestation in turkeys. The location of the parasite has made successful treatment difficult. Since *C. contorta* infestation (identified by Wehr) has been observed by the writer in one flock

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of turkeys in Arkansas and two flocks in Florida and treated with satisfactory results, observations on these flocks are reported herein.

Symptoms: There was a remarkable similarity of symptoms in the three flocks, which consisted of 800, 1,200 and 500 birds of varying ages under eight months and confined to three-, ten- and eight-acre tracts, respectively. Infestation appeared first in the older birds in each flock; later, those of all ages became affected. Infested birds first appeared indisposed, weak and droopy with a slight elevation of the fore part of the body from the normal position and were not inclined to move unless forced to do so. These symptoms rapidly increased in intensity, until the long axis of the body was almost perpendicular—a penguin-like posture (fig. 1). The head was drawn close to the body and when the bird was forced to move, the curvature of the neck resembled the letter "S" laid sidewise. Affected birds frequently swallowed and, in doing so, would always extend and "duck" their heads.

Emaciation occurred and at death affected birds were very light. In all of the flocks, one to three birds developed symptoms each day. Deaths occurred at about the same rate. Sudden deaths and lameness, as noted by Cram,[1] were not observed. The course of the disease after symptoms were shown varied from five to twelve days. Affected birds seldom recovered, indicating the pathogenicity of the infestation.

Gross Examination: Macroscopic lesions were confined to the esophagus and crop. The crops were devoid of foodstuff, indicating perhaps that starvation was the direct cause of death. The walls of the esophagus and crop were thickened. The entire mucosa of the esophagus usually showed marked hemorrhagic inflammation. Areas of intense hemorrhagic inflammation often occurred in the crop. Small, closely adhering, necrotic masses and areas of surface epithelium necrosis were observed, particularly in the crop. (See figure 2.) In most instances, parasites were not visible. The esophagus and crop were incised longitudinally and immersed in water. Some parasites began to emerge within five to ten minutes. With care they could be pulled free slowly, without breaking. Parasites occurred throughout the entire length of the esophagus and in the crop. No effort was made to determine the number of parasites present. The longest female parasite found in each of the three flocks varied from 70 mm. to 83 mm., which approximated the longest female observed by Cram in turkeys (80 mm.).

Microscopic Examination: A histological study was made of the esophagus and crop of a number of birds. The epithelium of the mucous membrane was thickened; the cells at the basement membrane were usually hyperplastic, and often finger-like processes extended into the subepithelial tissue; many areas of hypertrophy and necrosis occurred; epithelial cells often showed cloudy swelling. There were many areas in which the superficial layers of epithelium were necrotic and some areas in which the mucosa had been entirely denuded of surface epithelium. (See figure 3.) At such points, cellular infiltration with large mononuclear cells usually occurred. Hemorrhage occurred at some points. Scattered areas of congestion and cellular infiltration occurred in the subcutaneous tissue, often in close proximity to glandular tissue. The involuntary muscle, endothelium and glandular epithelium usually showed cloudy smelling. Edema, focal and diffuse, and cellular infiltration often occurred in the serosa.

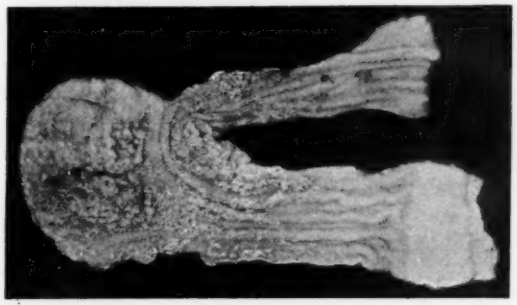

Fig. 2. Crop and esophagus of an affected turkey.

The parasites were confined entirely to the surface epithelium and were surrounded

usually by slight connective tissue formations. Free eggs occasionally occurred in the capsule. (See figure 4.) Eggs, varying in number from one to clusters of ap-

Fig. 3. Photomicrograph, showing necrosis of the esophageal epithelium, hemorrhage and C. contorta eggs (x 260).

proximately 100, were observed among the epithelial cells. In some instances, these eggs were being discharged into the lumen. Small whorls of young connective tissue and of epithelial cells were noted in many areas in the stratified epithelium; the significance of these whorls was not determined. It is possible, however, that they may indicate newly infested areas.

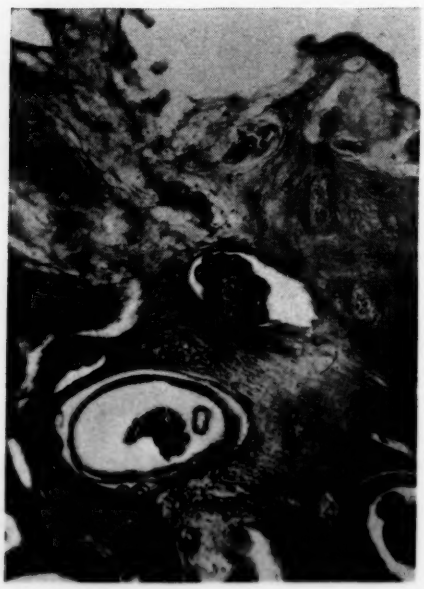

Fig. 4. Photomicrograph, showing parasite eggs and a parasite (C. contorta) in the stratified, squamous epithelium of the crop (x 400).

In all three flocks, treatment consisted of feeding the entire flock 5 per cent of commercial flowers of sulfur in the regular mash. Improvement was noted in many affected birds within four days and additional birds failed to develop symptoms after three days. The treatment was continued for three weeks, during which time there was progressive improvement. Recovery occurred in all affected birds which were able to eat when treatment was started. The mechanism of action of sulfur was not determined. The results of this treatment are interesting, since the feeding of 5 per cent of commercial flowers of sulfur in the regular mash produces no appreciable beneficial effect in cases in which round worms occur free in the intestinal tract.

SUMMARY

Observation on three flocks of turkeys, consisting of 800, 1,200 and 500 birds infested with *Capillaria contorta* showed that the characteristic symptoms were indisposition, weakness, droopiness, emaciation, frequent swallowing, and a penguin-like position of the body. Macroscopic lesions consisted of catarrhal and hemorrhagic inflammation, thickening, necrosis, and sloughing of the mucosa of the esophagus and crop. Microscopic lesions consisted of areas of hyperplasia, hypertrophy, necrosis, and hemorrhage in the layers of epithelium. *C. contorta* did not penetrate deeper than the basement membrane. A satisfactory treatment consisted of feeding the flocks 5 per cent of sulfur in the regular mash for a period of three weeks.

ACKNOWLEDGMENT

The author wishes to acknowledge the courtesies extended by Mr. B. Schwartz, chief of the zoölogical division, U. S. De-

(*Continued on next page*)

A Survey of the Blood Parasites of Birds Caught for Banding Purposes*

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A SURVEY of the parasites of the blood of wild birds, made upon smears taken over a period of ten years, is presented here. Our knowledge of these parasites has increased considerably during the decade of this study. This is particularly true of the avian parasites of the genus Plasmodium. For, only a little over a decade ago the idea was prevalent that these parasites all belonged to one species. At least a dozen species widely different in morphology and physiological characteristics are now known. Although knowledge of Haemoproteus, Leucocytozoon, Trypanosoma, and other parasites of the blood of birds has not undergone a proportionate growth, valuable additions have been made to our knowledge of them. The difficulties connected with the proper study of the parasites of such an elusive group of hosts are immense. However, until our knowledge of the systematics, distribution, life cycles, pathogenicity, and transmission of all of the avian blood protozoa has been much extended, we shall not be able to make a complete survey of them.

*This work was aided by grants from the international health division of the Rockefeller Foundation (malaria field studies).

About ten years ago the writer began to enlist the aid of volunteer bird banders in securing blood smears from migratory birds, in the belief that this coöperation would rapidly increase our knowledge of avian blood protozoa. By this method the trapping, handling and identification of the birds are placed in the hands of the ornithologist, while the staining and examination of the smear and the identification of the parasites are assigned to the parasitologist. By making trips to the banding stations, the parasitologist can also collaborate with the bander in attempting to isolate laboratory strains of the parasites. The survey herein presented is not a comprehensive one; in fact, such a survey is not possible at present. These data have been collected incidental to other undertakings, but their presentation in survey form reveals certain facts not easily seen when they are viewed individually.

Most of the smears examined were made by bird banders and sent to me unstained. In other cases I made visits to the banding station to secure them. Often when interesting parasites were encountered, the bander could be informed of the band number and he could secure additional smears when the bird was recaptured. The following persons have coöperated in supplying me with the smears:

Mr. Oliver L. Austin, Jr., Cape Cod, Mass.; Mrs. R. B. Harding, Brookline, Mass.; Mr. F. J. Lurvey, Somerville, Mass.; Mr. Joseph Mailliard, San Francisco, Calif.; Mr. M. J. Magee, Sault Ste. Marie, Mich.; Professor O. A. Stevens, Fargo, N. D.; Mr. W. W. Taber, Jr.; and Mr. W. B. Taber, 3rd, of Kansas, Ill. By far the greatest proportion of the smears were

(*Continued from page 614*)

partment of Agriculture, Washington, D. C., in the preparation of this paper.

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obtained by Mr. Taber and his son at Kansas, Ill.

RESULTS

The following tabulation summarizes the general features of the survey:

Total number of smears examined	967
Number of smears showing no parasites	702
Number of smears showing one or more parasites	265
Total number of infections found	414
Number of species of birds with negative blood findings	49
Number of species of birds with one or more parasites	32

No blood parasites were found in any of the following birds: bobwhite (23), killdeer (6), chimney swift (8), red-bellied woodpecker (4), kingbird (6), eastern phoebe (3), Bewick's wren (5), grey-cheeked thrush (3), Wilson's thrush (4), hermit thrush (5), starling (11), clay-colored sparrow (3), Gambel's sparrow (10), Lincoln's sparrow (8), tree sparrow (10), and towhee (4). In addition negative results were obtained from 33 species of birds in which not more than two individuals were examined. They were distributed among five orders, as follows: Falciformes (1), Charadriiformes (3), Micropodiformes (1), Piciformes (2), and Passeriformes (26).

Table I summarizes the positive findings according to host species and genera of parasites. From the totals in this table it will be seen that 324 infections with Haemoproteus were found, or about one out of each three birds examined was infected. Since infections of Haemoproteus can not be transmitted by inoculations of blood, identifications of the species of this genus are usually not possible. The morphology of the gametocytes is therefore about the only characteristic which is available for species differentiation.

In a number of instances these stages differ sufficiently to make a species identification fairly reliable; for example, *Haemoproteus sacharovi* and *maccallumi* of the mourning dove are easily distinguished by the morphology of the gametocytes. Also, the mature gametocytes of a species, found commonly in blue jays and northern flickers, tend to encircle the erythrocyte nucleus completely—a characteristic which would separate them from the common type of gametocyte represented in *H. columbae*. In the case of the mourning doves studied in this survey, 149 out of the 201 examined had infections with one or two species of Haemoproteus. Of these, there were 51 (34 per cent) infections of *H. sacharovi*, 34 (23 per cent) infections of *H. maccallumi*, 55 (37 per cent) mixed infections of these two species, and nine (6 per cent) were unidentified.

About one out of each 16 birds examined was found to be infected with a species of Plasmodium. The species of Plasmodium found are also shown in table I. Nine of these were isolated and established as laboratory infections in canaries. Several of them have been subjected to intensive study both in this laboratory and elsewhere. In one case a new species, (*Plasmodium hexamerium*) and in another a new variety (*P. relictum matutinum*) was described from these strains (Huff, 1935, 1937). The relative frequencies shown in this table are not to be interpreted as natural incidences, since the sampling was not random. In other words, the finding of an interesting parasite often served to lead us to the examination of other individual hosts of the same species.

Only one out of each 88 birds was infected with either Leucocytozoon or Trypanosoma.

The method of securing the smears—that is, through the coöperation of bird banders—made possible in a certain number of cases the examination of the same individual bird at different dates. Smears made from these "returns" gave some information upon the length of time the infection was carried. In attempting to interpret these findings it must, of course, be remembered that a negative finding may not mean absence of the infection, and also that the birds had opportunities to become reinfected between the dates of the taking of the smears. In table II it will be seen that (1) the smears from certain individuals were negative one year after being

TABLE I—Species of birds infected with one or more blood parasites; also numbers of uninfected individuals of these species.

Hosts		Parasites											
			Plasmodium:										
Order, Family, and Scientific Name	Common Name	Haemoproteus	Cathemerium	Circumflexum	Elongatum	Hexamerium	Relictum	Vaughani	Unidentified	Leucocytozoon	Trypanosoma	Number Negative
ANSERIFORMS												
Antidae												
Mergus serrator	Red-breasted merganser									1		
COLUMBIFORMES												
Columbidae												
Zenaidura macroura carolinensis	Mourning dove[1]	149			1				1		1	39
CUCULIFORMES												
Cuculidae												
Coccyzus americanus americanus	Yellow-billed cuckoo										1	
STRIGIFORMES												
Strigidae												
Otus asio	Screech owl	2								1		1
PICIFORMES												
Picidae												
Colaptes auratus luteus	Northern flicker	5										3
Melanerpes erythrocephalus	Red-headed woodpecker	1										6
PASSERIFORMES												
Corvidae												
Cyanocitta cristata cristata	Blue-jay	19										24
Troglodytidae												
Troglodytes aedon	House wren		1				2					32
Mimidae												
Dumetella carolinensis	Catbird	2		1	1							8
Toxostoma rufum	Brown thrasher	29									2	17
Turdidae												
Sialia sialis sialis	Bluebird	4				2*				2	2	2
Turdus migratorius migratorius	Robin	2					1	5	1			24
Compsothlypidae												
Icteria virens virens	Yellow-breasted chat	1										
Geothlypis trichas trichas	Maryland yellowthroat	1				6						2
Dendroica tigrina	Cape May warbler	1		1*								
Ploceidae												
Passer domesticus domesticus	English sparrow		5*		2**		1		5		2	110
Icteridae												
Angelaius phoeniceus	Redwing	2										5
Quiscalus quiscula aeneus	Bronzed grackle[2]	45	2*		3*		3		7	4	1	63
Sturnella magna	Meadowlark				1*			1*		1		2
Fringillidae												
Carpodacus purpureus purpureus	Purple finch	4										16
Junco hyemalis hyemalis	Slate-colored junco	1								1		20
Melospiza melodia melodia	Song sparrow	2			1				2			15
Passerina cyanea	Indigo bunting	1									1	5
Richmondena cardinalis cardinalis	Cardinal	8									1	10
Spinus tristis	Goldfinch	2										2
Spizella pusilla pusilla	Field sparrow				1							8
Zonotrichia leucophrys nuttalli	Nuttall's sparrow	2										7
Zonotrichia leucophrys leucophrys	White-crowned sparrow	2								1		14
Zonotrichia leucophrys gambeli	Gambel's sparrow	1										2
Zonotrichia querula	Harris's sparrow	4										15
Zonotrichia coronata	Golden-crowned sparrow	26							1			81
Zonotrichia albicollis	White-throated sparrow	8							1			12
	Totals	324				59				11	11	545

[1]One with Haemogregarine?
[2]Two with microfilaria.
* or **One or two strains isolated and established in canaries.

found to be infected (blue jay A320341, and mourning dove A451421); (2) that other individual birds acquired infections in the intervals between bleedings (cardinal A281909, mourning dove 34-403973); and (3) that individuals having one type of infection or combination at one time showed another type or combination at later dates. Of particular interest is mourning dove A426876, which on April 18, 1932, had an infection of *H. sacharovi*. It was examined next on May 17, 1934, and found to be infected with *H. sacharovi* and *H. maccallumi*. Smears made on June 6, and June 19, 1934, and on May 10, 1935, contained both parasites.

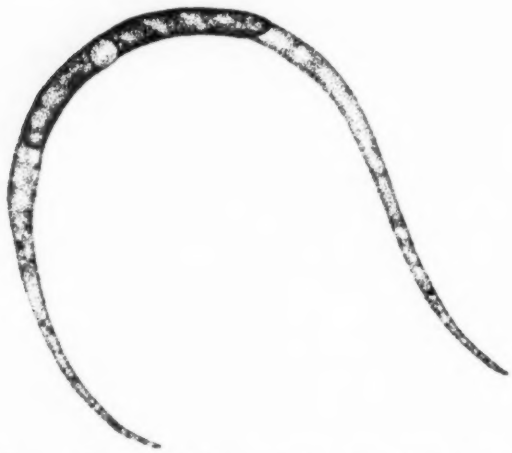

Fig. 1. Organism of obscure nature from blood smear of canary. There is a close resemblance to Sergentella hominis Brumpt, 1910. (75μ long, 2μ in diameter at center.)

Table III contains the information bearing upon the age of the birds when the infections are acquired. These data show clearly that the young birds which have not yet left the nest may already possess infections with Haemoproteus, Leucocytozoon, and Plasmodium, and that infections with Trypanosoma appear while the bird is as yet immature. One meadowlark recorded as "sick" was infected with a Plasmodium.

Several individual birds showed concomitant infections with more than one species of parasites, as follows:

Haemoproteus + Plasmodium	6 cases
Haemoproteus + Leucocytozoon	4 cases
Haemoproteus + Trypanosoma	4 cases
Leucocytozoon + Plasmodium	1 case
Haemoproteus + Trypanosoma + Plasmodium	1 case
Haemoproteus + Leucocytozoon + Plasmodium	1 case
Two species of Plasmodium	3 cases

One organism of obscure nature was found in the fourth subinoculation in canaries from a bronzed grackle along with a strain of *P. elongatum*. The organism (see fig. 1) was 75μ long and 2μ in diameter at the center, with long pointed ends, a distinct nucleus and nucleolus but without organelles of locomotion. A subinoculation was made in May, 1934, from a bronzed grackle into a canary. Subinoculations to other canaries were made July, 1934, March 15, 1935, and March 26, 1935. The organisms appeared in the last mentioned canary, but were not observed upon subsequent passage. They seem to resemble very closely the organism, *Sergentella hominis* Brumpt, 1910, described from an Algerian.

DISCUSSION

Of the 32 species of birds recorded here as being infected with one or more species of blood protozoa there are 17 new records of Haemoproteus, five for Plasmodium and six for Leucocytozoon. The records for Trypanosoma were given to Roudabush and will appear in a forthcoming publication. The Trypanosoma from the bluebird recorded herein is discussed by Coatney and Roudabush (1937). The records of Haemoproteus, Plasmodium, and Leucocytozoon have been checked against the recent catalogs and check-lists of Coatney (1936, 1937) and Coatney and Roudabush (1936).

Twenty-six of the 32 species (81 per cent) were infected with Haemoproteus; 14 with Plasmodium (44 per cent); seven with Leucocytozoon (22 per cent); and eight with Trypanosoma (25 per cent). The highest percentage of Haemoproteus infections (80 per cent) occurred in mourning doves; brown thrashers and northern flickers were next lower (50 to 60 per cent); blue jays and blue birds next (40 to 50 per cent); bronzed grackles next (30 to 40 per cent), and all others were less than 30 per cent or were examined in too small numbers to be significant. Although I was able in 1932 to effect transmissions of *H. sach-*

TABLE II—Blood findings on "returns"; parasites found in individual birds examined two or more times.

Species of Bird	Band Number	Sex	First Smear		Second Smear	
			Date	Parasites	Date	Parasites
Bluebird	F106957	Ad. ♂	June 18, 1934	Haemoproteus and Leucocytozoon	May 25, 1935	Trypanosoma
Blue jay	A320341	Ad.	May 25, 1934	Haemoproteus	April 28, 1935	Negative
Brown thrasher	B376593	Ad.	June, 1933	Haemoproteus	April 9, 1935	Haemoproteus
Brown thrasher	B376598	Ad.	July, 1933	Haemoproteus	June 27, 1934	Haemoproteus
Cardinal	A281909	Ad. ♂	Mar. 28, 1935	Negative	April 27, 1935	Haemoproteus
Cardinal	A281910	Ad. ♀	Mar. 30, 1935	Negative	April 17, 1935	Haemoproteus (young forms)
Mourning dove	A426876	Ad. ♀	April 18, 1932	*Haemoproteus sacharovi*	May 17, 1934	*Haemoproteus sacharovi* and *maccallumio*
Mourning dove	A426887	Ad. ♂	June 16, 1932	*Haemoproteus sacharovi*	April 3, 1935	*H. sacharovi* and *maccallumi*
Mourning dove	A451421	Ad. ♀	July 2, 1933	*Haemoproteus sacharovi*	Aug. 20, 1934	Negative
Mourning dove	34-403914	Ad. ♂	May 27, 1934	*Haemoproteus sacharovi*	April 6, 1935	*H. sacharovi* and *maccallumi*
Mourning dove	34-403934	♂	June 1, 1934	*H. sacharovi* and *maccallumi*	May 10, 1935	*H. sacharovi* and *maccallumi*
Mourning dove	34-403936	♀	June 7, 1934	*H. sacharovi*	April 6, 1935	*H. sacharovi* and *maccallumi*
Mourning dove	34-403973	Ad. ♂	Aug. 26, 1934	Negative	April 13, 1935	*H. sacharovi*
Mourning dove	34-403992	♀	April 27, 1935	*H. sacharovi* and *maccallumi*	May 10, 1935	*H. maccallumi*
Northern flicker	34-336025	Ad. ♂	Mar. 25, 1935	Haemoproteus	April 28, 1935	Haemoproteus

*The same species of parasites were found again on June 6, 1934, June 19, 1934, and May 10, 1935.

TABLE III—Infections in immature birds.

Host Species	Age or Condition	Number	Date	Parasites Present
Bluebird	Immature	2	June, 1934	Haemoproteus
Bluebird	Immature	1	June, 1934	Plasmodium, Trypanosoma
Blue Jay	Fledgling	2	June, 1933	Haemoproteus
Mourning dove	Immature	2	Aug., Sept., 1929	Haemoproteus
Bronzed grackle	Fledgling	3	June, 1932	Haemoproteus (young forms)
Bronzed grackle	Nestling	3	May, June, 1934	Haemoproteus
Bronzed grackle	Nestling	1	June, 1933	Leucocytozoon, Haemoproteus, *Plasmodium relictum*, *P. elongatum*
English sparrow	Immature	1	June, 1932	Trypanosoma
English sparrow	Immature	1	June, 1932	Plasmodium
Meadowlark	"Sick"	1	Nov., 1933	Plasmodium vaughani
Screech owl	Immature	1	July, 1934	Haemoproteus, Leucocytozoon

arovi and *H. maccallumi* from mourning doves to pigeons by means of *Pseudolynchia maura*, attention was called at that time to the absence of any records of Hippoboscid flies on mourning doves. Since then, however, Herman (1937) has found four mourning doves, out of a total of over 100 examined on Cape Cod, infested with *Ornithoica confluenta* Say, and Coatney (1938) has found a specimen of *Stilbometopa podopostyla* Speiser on a mourning dove in Nebraska. Brennan (1938) records taking *Microlynchia pusilla* in fairly large numbers and *S. podopostyla* somewhat less abundantly from doves killed near San Antonio, Texas. Natural transmission of the Haemoproteus infections of doves by Hippoboscids remains the best hypothesis.

These results prove the method of cooperative work between bird banders and parasitologists to be effective in yielding information upon the kinds of frequencies of blood protozoa among nondomesticated birds and the age of the bird at which the infections are acquired (hence of value in studying the transmission of the parasites). More extensive use of the same methods to include other species of birds in other regions of the world ought to bring us more information on these points. Likewise, the accumulation of more data by these methods will enable us to evaluate the effects of the parasites on the birds, the possible effects of migration of the birds on the dissemination of the parasites, the correlation of the occurrence of blood parasites with ectoparasites living on the bird or found in the vicinity of nests or roosting places of the birds, and many other interesting facts relating to these questions.

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Tattoo for Hunting Dogs

The American Sportsmen and Hunting Dog Owners Association is backing a bill to compel owners of registered hunting dogs to have tattooed identification marks either on the ear or belly of their dogs, and to keep these on file with the state.

Trumpeter Swan

Recent reports indicate that the trumpeter swan, once thought in grave danger of extinction, is making a recovery in both Canada and the United States, *Hunting and Fishing* points out. Most of the wintering bands under observation in British Columbia contain sufficient cygnets to insure perpetuation of the species as long as adequate protection is afforded.

The Sylvatic Plague

BUBONIC plague, or rather sylvatic plague, as duly baptized by Prof. Karl F. Meyer of the Hooper Foundation, is now known to be spread by the flea carried by rodents, particularly rats. While the disease is rare in the United States, it is nevertheless a constant threat to public health and, inasmuch as animals play an important part in its transmission to man, this disease may be always regarded as one of the veterinary problems of this day. Better to study the flea as a transmitter of this plague, the Hooper Foundation has established a flea laboratory, which was made possible by a gift of $24,000 of the Rosenberg Foundation for research at San Francisco.

The newly constructed laboratory is a two-story concrete building, where there are caged dozens upon dozens of rodents, gotten from every spot in the western part of the United States where bubonic plague has been found among animals. From these animals fleas are combed and studied to determine whether they are infective or not. If infective, the district whence the animal came is regarded as a source of the contagion, a place where the infected rodents require attention.

Engaged with Dr. Meyer in this work are Drs. Charles M. Wheeler, entomologist, and Morris A. Stewart, of the College of Agriculture of California, together with other specialists who are making a systematic campaign against bubonic plague in the United States.

We are indebted to Col. Foster, past president of the Association, for a newspaper clipping describing this unique department in public health work.

Some Factors Involved in the Deficiency Diseases*

By A. H. QUIN, D. V. M.
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BECAUSE OF their spectacular nature and economic potentialities, animal diseases due to pathogenic bacteria, viruses and parasites have largely dominated our thoughts and concepts of disease control.

However, within the past twenty-five years, there has been a growing conviction that nutrition plays a major rôle in the maintenance of animal health. Hence, any consideration of etiological factors involved in the diagnosis of either herd or individual cases must necessarily include a survey of nutrition and its direct or indirect relation to the case in question. This is of special importance, for it must be remembered that many nutritional diseases in their clinical aspects closely resemble those due to infective agents, as nutritional roup of fowls due to vitamin A deficiency, and that specific deficiencies serve as predisposing factors for losses due to bacteria and parasites.

Any consideration of deficiency diseases naturally falls into two classifications, namely, those due to insufficient or faulty inorganic mineral elements and those due to lack of specific activating, organic, chemical substances called vitamins.

PHOSPHORUS-CALCIUM COMPLEX

While mineral deficiencies of one kind and another may occur under the most diverse conditions, it is generally acknowledged that maladies due to deficient phosphorus intake are most common in semi-arid or desert regions or in terrains where heavy seasonal rains contribute to erosion. In regions where soil and forage ordinarily contain an optimum phosphorus content, drouth may precipitate aphosphorosis. Specialized feed, especially beet pulp or distillers' mash, ordinarily requires additional phosphorus supplements if trouble is to be avoided.

But, whenever one considers the supply and utilization of phosphorus, it is also necessary to consider calcium, for there is a very direct and distinct relationship between these two most essential elements.

In normal metabolism, phosphorus and calcium intake must be in reasonable balance. Thus an excessively high phosphorus intake may deplete an already deficient supply of calcium. Especially is this true if the ration is deficient in vitamins A and D. Thus, according to Dukes,[1] a ratio of phosphorus pentoxide to calcium as high as 3 to 1 is well tolerated by cattle. On the other hand, Campbell and Merillat[2] have cited the occurrence of osseous deformities and arthritic pathology in horses continually subjected to an unbalanced calcium-phosphorus ratio.

Speaking broadly, calcium deficiencies are less likely to occur in cattle and sheep because of outdoor environment and rations containing large amounts of grasses and leafy plants. Swine and domestic fowl, in contrast, because of their access to concentrated feeds containing a high content of seeds, meat by-products and vegetable oils, are less prone to phosphorus deficiency but readily exhibit the bad effects of low calcium rations.

Small animal practitioners must be constantly on the alert for early manifestations of phosphorus and calcium deficiencies because carnivores, especially puppies, easily develop nutritional pathology when fed deficient rations and given little access to sunlight.

In this respect it might be well to remember that rachitis is more an aphosphorosis than a calcium deficiency, as shown by blood tests which indicate a marked drop in blood phosphorus before any evidence of hypocalcemia is demonstrable.

*Presented at the following meetings: Colorado Veterinary Medical Association, Denver, October 7-8, 1938; Intermountain Livestock Sanitary Association, Salt Lake City, Utah, January 9-11, 1939; Tennessee Veterinary Medical Association, Nashville, January 23-24, 1939; and Mississippi Veterinary Medical Association, Hattiesburg, January 26-27, 1939.

SYMPTOMS

The symptoms of phosphorus deficiency are too well known to merit anything except the most passing mention. Essentially, these symptoms are gradual loss of appetite, bone chewing, stiffness, irregular heat and low herd fertility. Osseous changes, as osteomalacia, osteoporosis and osteofibrosis, are seen in advanced cases. The condition called "creeps" in Texas range cattle is a classic example. Posterior paralysis and vertebral softening are common manifestations of this deficiency in swine.

GRASS TETANY

Practitioners in some sections, especially in Kansas, Nebraska and Oklahoma, often mention a condition called grass tetany that occurs among cattle during the spring months. It is manifested shortly after cattle are turned to young and lush catch pastures of rye, wheat or barley. The trouble is more common when the animals, especially dairy cows, have been wintered on poor rations.

Early symptoms are nervousness, muscular tremors, excitement, incoördination and, often, profuse diarrhea. Affected animals soon go down and present a clinical picture almost identical with that of true milk fever. However, in grass tetany both sexes are involved and the trouble has little or no relation to calving time.

While we are not acquainted with any blood chemistry studies of grass tetany, it is most probable that the disease is due to a quick depletion of body calcium, for affected animals respond surprisingly well to intravenous administration of calcium and dextrose. A shortage of vitamin D in such forage and the fact that diarrhea may deplete blood calcium by dehydration must be considered.

In this, as in almost all calcium-phosphorus deficiency troubles, a proper supply of pure, steamed bone meal should serve as a specific preventive.

IMPORTANCE OF SALT

No discussion of deficiency troubles is complete without calling attention to the absolute importance of an adequate salt supply, especially for herbivorous animals. In that metabolism is dependent upon normal digestion and, in turn, that normal digestion is dependent upon hydrochloric acid which hinges on the sodium chloride intake, one can readily visualize the many abnormalities that result from salt hunger. Becker, Neal and Sheally[3] have shown that salt consumption varies somewhat as follows: dairy heifers on legumes, corn silage and grains, 3.9 pounds per month; Hereford steers on grass, 1.5 pounds per month; dairy heifers and cows on winter rations (legumes, silage and mixed grains) 3.19 pounds per month. Twenty head of Kansas steers on corn silage each consumed the surprising quantity of 9.33 pounds of salt in a single month.

IODINE

Newsom[4] states that iodine deficiency occurs in the northwest section of Colorado, especially during drouth years. It is commonly accepted that most of the mountain and great plains sections are marginal iodine-deficient areas. Hence, although iodine defiiency is not so marked that it results in goiter and hairlessness of the new born, it is very probable that better herd health, fertility and vitality of young stock would result from an ample year-round supply of essential iodine.

In this regard, Huffman[5] of the U. S. bureau of animal industry, Utah, states:

> Commercial iodized salt contains approximately 1.5 grains of potassium iodide per pound. Figuring the salt consumption of sheep at one-third pound per month and that of cattle at two pounds, the monthly potassium iodide consumption, including any wasted, would be one-half grain for sheep and three grains for cattle, and the total potassium iodide taken during the entire gestation period would be 2½ grains and 27 grains, respectively. This is probably little above a safe minimum in badly affected areas.
>
> There are, however, certain conditions under which animals will not eat sufficient salt of this iodine strength to prevent goiter. Where the hay has been salted at harvesting time, it has been found necessary to feed a mixture of potassium iodide and salt prepared at the rate of 1 to 1,600, or three times the strength of the commercial mixture. Both sheep and cattle may not consume sufficient block iodized salt and they should therefore be fed the iodized

stock salt in order to insure normal salt consumption.

IRON AND COPPER

The importance of iron deficiency, or rather iron and copper deficiency, for it has been shown that the latter element is synergistic for iron, is evidenced by extensive losses from suckling anemia in the pig crop of the Midwest. It occurs in McLean-raised pigs and is characterized by plethora, thumps, edema and heavy mortality.

This type of iron-copper deficiency anemia also was noted in young fox pups raised in wire-floored pens, and it is very probably the cause of death in young wild animals raised in zoos. In the suckling-anemia case involving fox pups, losses were stopped almost immediately by dusting the floors of the kennels with a powder consisting of five pounds of iron sulfate and one pound of copper sulfate in 100 pounds of Fuller's earth.

COBALT

New light on the iron-deficiency condition, variously known as loin disease, salt sickness, enzoötic marasmus, bush-ill, coast disease, etc., has resulted from the studies of Underwood and Filmer[6] in Australia. This disease with such a multiplicity of names occurs among cattle, sheep and goats and is characterized by progressive emaciation, depraved appetite, retarded growth, infertility, digestive upsets, paralysis and anemia. Herds on ranches and farms where enzoötic marasmus exists readily recover when moved to so-called "sound" pastures.

Brilliant research by the Australian investigators has shown that the liver, kidney and spleen of affected animals contained even more stored iron than is found in healthy animals and that the disease occurred regardless of variations in the iron content of soils and forage crops. Mass elimination experiments proved that the element cobalt is an ingredient necessary for the proper utilization of iron within the body. Typically affected sheep were cured by as little as 0.1 mg. of cobalt chloride added to the daily ration, while cattle, similarly affected, recovered and remained in good health when supplied daily with 0.3 to 1.0 mg. of cobalt chloride.

The results of this research are so far-reaching that our entire concept of the treatment of anemia may be changed.

LESSER MINERALS

Much yet remains to be learned of the deficiencies traceable to manganese and the lesser minerals. Some data have been presented to show that absence of manganese may account for the failure of females to suckle their young or to exhibit proper maternal instinct. This is a factor of importance to fur ranchers, to small animal practitioners and, to a lesser extent, to breeders of swine.

RATION BALANCE

While it is still true that a proper balance of proteins, carbohydrates fats and roughage is essential from a quantitative standpoint, this time-honored concept of animal rations is subject to sharp qualifications.

Proteins vary widely in respect to utilization, while the basic elements of carbohydrates are markedly influenced by climatic conditions, methods of storage, soil variants and numerous other factors.

Most important, however, is the fact that even in quantitatively adequate amounts, rations may be markedly lacking or even totally deficient in vitamins essential to health and even life itself.

THE VITAMINS

Although a quarter of a century has passed since Funk published his epoch-making report on vitamins, there is still much that remains to be told. However, recent advances in biochemistry, biology, medicine and veterinary science have given clinicians access to comprehensive, specific information on numerous deficiency diseases due to avitaminoses.

From 1932 to the present day the definite chemical formulae of at least five of the vitamins have been worked out. Vitamins B_1, B_2, C and the P-P or pellagra-preventive factor of Goldberger have been synthesized, that is, built up artificially from their component chemical elements. Vitamins A and D have been synthesized to the precursor or

provitamin stage as carotene and calciferol. Standardization tests have been developed and officially approved by the International Health Conference of the League of Nations. Full recognition of the proved vitamins has been included in the United States and British pharmacopoeias. In other words, despite theory, contradiction, commercial exploitation and misunderstanding, vitamin therapy is now on a firm footing. Discovery of the cause and specific treatment of rickets, beriberi, pellagra and blacktongue will form one of the most absorbing chapters of medical history.

VITAMIN A

The brief scope of a single paper precludes a survey of all of the avitaminoses.

Briefly, we know that deficiency of vitamin A results in nutritional roup of chickens and turkeys, certain types of paralysis and neuropathology in swine, the condition formerly known as "cotton seed poisoning" of feeder cattle, and night blindness of various species; also that it is closely related to the prevention of respiratory, digestive and urinary infections of young animals. Vitamin A deficiency also has been suggested as a predisposing factor of calculi in sheep.

It is not impractical to presume that an avitaminosis of the A type may be at least a predisposing factor in periodic ophthalmia of horses, in the incidence of pink eye in pastured cattle and in the corneal opacities that complicate canine distemper.

VITAMIN B_1

B_1 type deficiency results in inappetence, polyneuritis of fowls, paralytic symptoms in puppies (especially after distemper), faulty metabolism of carbohydrates and the beriberi-like diseases of dogs and swine.

Herbivorous animals possess the faculty of synthesizing this vitamin by bacterial fermentation in the rumen; hence, the B type deficiencies are seldom a factor in these species.

VITAMIN D

The rôle of vitamin D is more clearly understood than that of any other vitamin, with the possible exception of vitamin C. Its precursor or provitamin, ergosterol, is stored in the skin and is activated into vitamin D under the influence of sunlight or ultraviolet light. Overactivation of ergosterol in the skin is thought to be responsible for sunburn and may be implicated in the so-called "solar eczema" of line-backed Herefords in the southwestern states.

RACHITIC TETANY

Throughout Iowa and the northern states, cases of spasmophilia or tetany are not uncommon in bucket-fed calves kept indoors during the late winter and early spring. Usually such calves appear normal upon casual observation. When fed however, they may drop suddenly in a convulsiform seizure, roll their eyes, evidence marked dyspnea and recover after a brief comatose state.

Unless treatment is instituted, such calves may die during subsequent seizures. Cases never occur after calves are turned outdoors to spring pasture.

These are typical cases of rachitic tetany or spasmophilia due to vitamin D deficiency. Similar symptoms are sometimes noticed in swine. Specific prevention is possible through the use of viosterol, irradiated supplements or fortified cod liver oil.

During the autumn months of 1934, following the great drouth of that year, many practitioners of the Midwest reported veritable outbreaks of acute rickets in fall pigs.

In the main, however, vitamin D deficiencies are most often noted during the early spring months when animals have wintered poorly.

VITAMIN C

While monkeys, men and guinea pigs must have vitamin C, it is probably of minor importance in animal deficiencies, for most species, including birds, synthesize vitamin C within their own tissues. Marek and Wellman,[7] however, state that typical scurvy has been noted in dogs fed a ration of decomposing meat, unbalanced dog biscuits, cooked cereals with animal fats and well cooked meat and milk, and in swine on a diet of sterilized milk.

THE B COMPLEX

The rôle of those fractions of the vitamin B complex designated B_2, B_4, B_5 and B_6 are at present concerned with growth, reproduction and other metabolic activities of experimental animals. To these B fractions must be added the factor known as antianemia substance, which is isolated from steamed yeast. It is in some way related to the formation of red blood cells and the hemopoietic functions of the spleen. Vitamin B_2 or G must be considerd as a distinct entity.

VITAMIN E

Vitamin E is intricately related to the processes of ovulation and spermatogenesis, as well as to vitality and function of the placental membranes. Some authorities consider that this influence of vitamin E on the sex glands is secondary in that its primary purpose is to activate the anterior pituitary body, the hormone of which is directly related to maturation of follicles and development of sperm cells.

Although thermostable and widely distributed in grains and forage, it is unstable in the presence of changes due to rancidity. It also has been established that body reserves of vitamin E are rapidly depleted and require frequent renewal.

For these and several other reasons, surety of supply is best attained by an artificial supply of biologically assayed, cold-pressed wheat germ oil, either by subcutaneous injection or by feeding.

It should be remembered, too, that maximum results from use of wheat germ oil can be obtained only when it is backed by rations yielding adequate amounts of vitamins A and B.

Some evidence has been marshalled to prove that susceptibility to *Brucella abortus* is more pronounced in herds having inadequate intakes of vitamin E.

During the drouth of 1934, farmers of southern Iowa noted a marked failure of proved cows and heifers to conceive when bred the next spring. After grazing on the normal summer pastures in 1935, these same animals conceived readily without supplemental treatment—a rather clear-cut example of functional sterility due to vitamin deficiency.

THE SKIN FACTOR

To those who are in small animal practice the experimental studies on vitamin H may be of direct and practical interest. This vitamin occurs in an acid-reacting substance isolated from kidneys, liver and yeast. Its absence causes seborrhea, psoriasis and allergic eczema in experimental rats. This may point the way to the true cause of similar idiopathic skin lesions in dogs.

VITAMIN K

Of special interest are the lately published reports on the "Coagulation Vitamin" or vitamin K (Osterberg,[8] Almquist[9]).

This vitamin was first demonstrated as the causative factor in a hemorrhagic condition affecting baby chicks. Alfalfa, of all sources studied, is richest in vitamin K, although it also has been isolated from fish meal, cod liver oil, cabbage and spinach.

Utilization of vitamin K is dependent upon proper absorption of sterols from the intestine—a function which does not occur in the absence of bile. Thus, in human patients at the Mayo clinic, Osterberg and his coworkers demonstrated that fatal bleeding in patients with generalized jaundice and occlusion of the bile duct was due to a low prothrombin index and, further, that a normal prothrombin index is dependent upon absorption of vitamin K from the intestine.

The same factors are involved in sweet clover poisoning of cattle, as it is presumed that bacterial by-products in spoiled sweet clover hay destroy vitamin K, thus precipitating a low prothrombin index and tissue hemorrhage. Supplemental feeding of alfalfa with sweet clover in as little as 5 per cent of the total ration prevented the disease.

VITAMIN G

Without question, the recent announcement by Elvehjem[10] that deficiency of nicotinic acid amide—a component of the vitamin B_2 or G complex isolated from liver—ranks as one of the greatest discoveries of

the present century. In March, 1938, Elvehjem[11] concluded:

> The factor necessary for the cure and prevention of blacktongue in dogs produced on a modified Goldberger diet has been isolated from liver and identified as nicotinic acid amide. Both nicotinic acid and nicotinic acid amide are effective in curing blacktongue in dogs and in maintaining dogs in a normal condition on the basal blacktongue-producing diet.

His work has since been confirmed by Street and Cowgill,[12] and others.

Nicotinic acid, chemically beta-pyridine carboxylic acid, is now produced synthetically and is available commercially as sodium nicotinate. The initial curative dose, subcutaneously or intravenously, ranges from 5 to 10 mg. for each three pounds of bodyweight. This should be repeated daily until acute symptoms subside and the dog begins eating. Then, oral administration of 30 mg. may be repeated daily with tablets. As far as we know, sodium nicotinate is not toxic within reasonable limits.

The discovery that nicotinic acid deficiency is the factor responsible for blacktongue may also point the way to the true etiology of hemorrhagic dysentery in feedlot swine. Some studies along this line have already been made, for example, the paper of Chick, Macrae and Martin[13] entitled, "The Curative Action of Nicotinic Acid on Pigs Suffering from the Effects of a Diet Consisting Largely of Maize."

Hemorrhagic enteritis of feeder swine is most commonly seen in hogs following cattle, their ration consisting mainly of cattle manure containing undigested corn. Such a ration is probably not only deficient in vitamin B_2 or G but also in vitamins A and B_1. Some excellent results have already been noted where newly purchased feeder pigs back of cattle have been given access to alfalfa and vitamin supplements through creep feeding.

Despite the exploitation of mineral vendors and "farm to farm" vitamin specialists, the fact remains that deficiency diseases are a factor of great importance in any area where animal husbandry is practiced. Their diagnosis, control and treatment are wholly within the province of the qualified practitioner and I feel that it behooves all of us to keep abreast of research in this field.

SUMMARY

A general survey of the deficiencies due to lack of inorganic mineral elements and vitamins is given. The most important inorganic mineral deficiency is that traceable to the phosphorus-calcium complex. Mention is made of grass tetany of cattle, an acute hypocalcemia, and spasmophilia of bucket-fed calves, presumably an avitaminosis of the D type. The rôle of cobalt in utilization of iron is mentioned. In addition to the general features of the common A, B, C and D type avitaminoses, a brief survey of vitamin K, the coagulant vitamin, and nicotinic acid are added and the suggestion made that the latter may be a factor in hemorrhagic enteritis of feedlot swine following cattle.

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Factors Applied in the Grading of Dressed Beef and Poultry Carcasses

By J. B. MORSE, D. V. M.
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A VETERINARY reserve officer on duty with the Civilian Conservation Corps is held responsible for the inspection of all foods going to the camps in his corps area. To qualify for this work, the officer must familiarize himself with the grading of dressed carcasses of beef, veal, lamb and mutton, and poultry. Also, he must be a capable grader of butter, eggs and cheese and have a thorough knowledge of the various manufactured products purchased for the camps.

All of this knowledge is essential, for it is the veterinary officer's duty to see that the consumers of these foods receive what the government is paying for.

As dressed beef is one of the largest food items, I shall use that as a criterion and compare it with the grading of dressed poultry. In classifying and grading dressed beef, the following factors are considered:

1. *Conformation* — the general build, shape and contour of the entire carcass, side or quarter. Factors that influence the conformation of a carcass are, to a large extent, breeding, feed and care.

2. *Finish*—the thickness, color, character and distribution of fat. A good finish adds to the attractiveness of the carcass and denotes good feeding and care, but the palatability of the meat depends upon the proper kind of fat.

3. *Quality*—the character of the flesh and fat. In considering this factor, a grader thinks of color. A light cherry-red color, for example, denotes that the animal has been exercised but little, that it has been fed intensively on the proper grain and is comparatively young.

Classification of Dressed Poultry

In the classification of dressed poultry, the following factors are considered:

1. *Plucking:*

(a) Scalded poultry are birds that have been plucked after being immersed in hot water, usually at a temperature of 170 to 180° F.

(b) Semi-scalded poultry are those that have been plucked after being immersed in hot water, usually at a temperature of 125 to 130° F.

(c) Dry-picked poultry are birds that have been plucked without wetting the feathers.

2. *Dressing:*

(a) Drawn poultry are those that have been eviscerated.

(b) Undrawn poultry are those that have not been eviscerated.

3. *Finishing:*

(a) Milk-fed poultry are birds with skin and flesh bleached by being milk-fed. The muscle fibers have been softened by fatty deposits throughout the connective tissue.

(b) Grain-fed poultry are those that do not show evidence of milk-feeding.

4. *Chilling:*

(a) Fresh-dressed poultry are birds that have not been hard-chilled or frozen.

(b) Fresh hard-chilled poultry are those that have been hard-chilled or frozen, show no evidence of deterioration from freezing, and have not been held at low temperatures for more than 60 days.

(c) Storage poultry are fowl that have been held at a low temperature for more than 60 days or show evidence of deterioration from freezing, regardless of the time held.

5. *Packing:*

(a) Dry-packed are either scalded, semi-scalded or dry-picked, packed dry and cooled without coming in direct contact with ice.

(b) Iced poultry are either scalded, semi-scalded or dry-picked, packed in ice.

Along with these descriptive terms, the grader must also familiarize himself with

the breed and sex of the various carcasses, so that he may classify them. There are five classifications of dressed beef: heifer, steer, cow, bull and stag.

Heifer beef is that of a female that has passed beyond the veal or calf stage, and is distinguished by the characteristics peculiar to the female. Steer beef is that of a male castrated before sexual maturity; also, the animal must have advanced beyond the veal (or calf) stage. Cow beef, that of a female which has had one or more calves or was in advanced pregnancy at the time of slaughter. Stag beef is that of a male castrated after having reached sexual maturity.

CLASSIFICATION OF DRESSED CHICKENS

There are two classes of dressed chickens: young and old. Under the first class are grouped (a) broilers, which are approximately eight to twelve weeks of age, of either sex, not weighing over 2½ pounds, well suited for broiling; (b) fryers, which are about 14 to 20 weeks old, either sex, weighing more than 2½ pounds but not over 3½ pounds, and sufficiently soft meated for frying; (c) roasters, those approximately five to nine months old, either sex, over 3½ pounds, which can be cooked tender by roasting; (d) stags, which are males of any weight or age, with flesh slightly darkened and toughened, and with comb and spur development showing a state of maturity between roasting chickens and cocks; (e) slips, incompletely caponized males weighing 4 pounds, with comb, spur and flesh development similar to that of stags, which for grading are classed as stags or roasters, according to the tenderness of the flesh, and (f) capons, unsexed males with soft, tender flesh, usually seven to ten months of age, weighing over 4 pounds.

Under the second class are grouped (a) cocks, which are mature males of any

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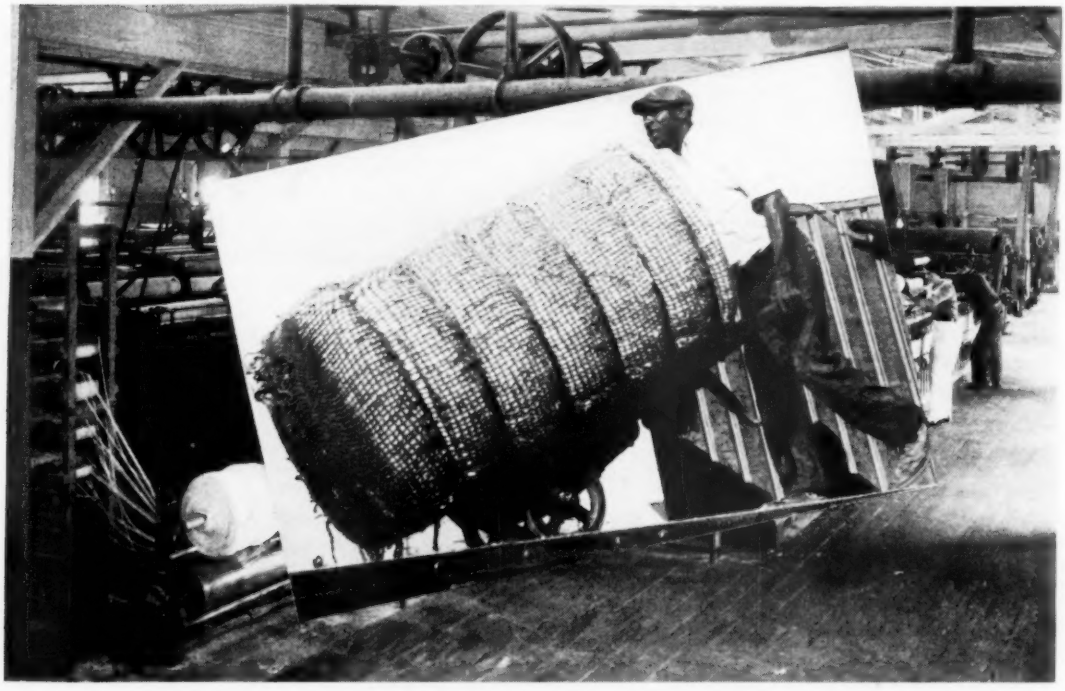


The cotton industry accounts for much of the economic importance of Memphis—the world's largest inland cotton market.

weight, with darkened and toughened flesh, and (b) fowl, mature females of any weight and age.

PRINCIPLES OF GRADING

All of the descriptive terms and definitions which I have discussed serve to form the foundation, as it were, for the very important function of grading, wherein every one of these terms and definitions is used. Grading is simply a continuation of the same analytical process used in classifying. In the first instance, beef was divided into five general groups called classes. Dressed poultry was divided into two classes with their respective subdivisions. Owing to the fact that many variations exist in all fundamental characteristics, it is impossible to consider satisfactorily the classes as a whole with the idea of determining their rating. The main objective in all grading is to determine values accurately.

In order to do this, still further subdivision of the product is essential. For example, we take a given class such as steer beef and divide it into smaller lots in such a way that the individual units that make up a given lot will have virtually the same conformation, finish and quality. In other words, each lot will be uniform in all essential respects. This method of grouping constitutes grading.

Grades of beef are based on variations in one or more of the three fundamental characteristics, *i. e.*, conformation, finish and quality. The same can be applied to poultry. As a rule, variations occur in all three, but it is possible for two carcasses to be identical in two of the characteristics and yet be placed in a different grade because of the variation in the third characteristic.

In a consideration of these characteristics in dressed beef or dressed poultry, quality is the most important factor. All dressed carcasses are bought and sold largely on this basis. There are many factors taken into consideration in grading a carcass and arriving at a conclusion as to the grade, but most important is the fact that the degree of quality must be determined, because the consumer is chiefly interested in the rating of the carcass he purchases.

The grader also considers firmness, color, and texture of the meat. The age is determined by the color and hardness of the bone, and careful observation is made of the marbling or lack of marbling in the flesh. The poultry inspector notes the same characteristics but, since poultry meat has no marbling, he concerns himself mainly with the texture, color and fineness of the grain.

All of these facts, however, are indicative only of the quality of the carcass or cut. Conformation and finish are important in that they have a bearing on the major consideration—quality. To the consumer, of course, the test of quality is the eating, and there are factors that definitely influence the quality of the carcass. For example, finish is easily determined, and a high degree of finish denotes proper feeding and fairly excellent quality.

It is fortunate that nature has so arranged matters that excellent conformation and fine finish rarely exist without being accompanied by a corresponding degree of quality.

GRADING TECHNIC

There are seven grades of beef: prime, choice, good, medium, common, cutter, and low cutter. Numerically expressed, the grades are No. A1, No. 1, No. 2, No. 3, No. 4, No. 5, and No. 6.

In poultry there are four grades: U. S. Special, U. S. Prime, U. S. Choice, and U. S. Commercial. Corresponding to the numerical designations of beef, in poultry there are: U. S. Grade AA, U. S. Grade A, U. S. Grade B, and U. S. Grade C.

With reference to the various grades, there is one variation in the grading of poultry and beef. In beef not all classes are divided into the full quota of grades, whereas in poultry they are. To explain this further, steer beef and heifer beef are divided into seven grades, Prime or No. A1 representing the highest, and Low Cutter or No. 6 the lowest. On the other hand, cow beef, stag beef and bull beef are divided into six grades with Choice (No. 1) representing the highest, and Low Cutter (No. 6) the lowest.

Despite the fact that each class of beef

has been divided into six or seven grades, each grade represents such a wide range of variation in the fundamental characteristics that sub-grades or intermediate subgrades are classed by the trade. The terms generally used are top medium, low or top good, and medium good or low good, and likewise with most of the other grades.

The beef or poultry grader gives certain weight to each of the characteristics, conformation, finish and quality. While these values are uniform throughout a given class, they vary between classes. To assist him further, detailed descriptions of the major grades have been more or less standardized. Meticulous care has been taken in selecting the name that is most suggestive of the grade. The terms adopted are those that have been used most generally, but with varying significance, by the trade, the press and by students of the industry.

DESCRIPTIVE TERMS FOR DRESSED STEER BEEF

To assist the grader in gaining a working knowledge of these terms, the following descriptions and definitions are used. For the sake of brevity, I shall use the descriptive terms applied to dressed steer beef.

1. Prime, or No. A1, is a carcass that has an ideal conformation, finish and quality. It is relatively short and blocky and is heavily and uniformly fleshed throughout. Rounds, loins, and ribs are extremely well developed and rounded. Chucks and plates are unusually thick, compact and heavily fleshed.

The neck is short and plump. Shanks are short and exceptionally well muscled. The superior muscular development of the round extends well down to the hock joint, yielding much beyond the average proportion of flesh in that cut. The spinous processes of the chine bones terminate in soft, pearly-white cartilages. The same is true of the breast bones. The bones are relatively soft and red.

The finish is ideal, being neither excessive nor deficient. The exterior surface of the carcass, including shanks and neck, is entirely covered with a smooth, brittle, slightly creamy white fat that is not excessively thick or wasty at any point, the greatest depth, which does not exceed ¾ of an inch, being over the loins and ribs. The interior walls are well covered. Cod, kidney, crotch, and other interior fats are abundant but not excessive, and are firm, crumbly, and of a creamy white color. An excessive or slightly deficient amount of fat will bar from this grade a carcass possessing all of the other qualifications.

The flesh is firm, velvety, very fine grained, and of light or cherry-red color. The thicker cuts possess an abundance of marbling.

2. Choice, or No. 1, is a carcass that has an excellent conformation, finish and quality. Rounds, loins, and ribs are very well developed and plump. Chucks and plates are very thick and heavily fleshed. The neck is short and thick. Shanks are short and well muscled.

The exterior fat is generally smooth, but may be slightly wavy. Cod, crotch and other interior fats may be slightly less or more than is required for the ideal carcass. Such fats are of excellent quality, being firm, brittle and creamy white.

The cartilages on the chine and breast bones may be pearly white and slightly ossified, especially in the young steer. The bones may be soft or red, slightly hardened, and of grayish white color, especially if the animal is nearing four years of age. The flesh is firm, velvety, and of an attractive, light, cherry-red color. Marbling is always present in the loins, ribs, rounds and chucks.

The chief difference existing between this grade of steer and a prime steer is in the quality and finish.

3. Good, or No. 2, is a carcass that has good conformation, finish and quality. It is somewhat above the average in all respects. The rounds are reasonably thick and heavily muscled, but are not full towards the shank. Loins and ribs are moderately full and plump but are inclined to flatness. Chucks and plates are moderately thick and broad. The neck is moderately short and thick; shanks somewhat long and tapering; the hip and shoulder joints slightly visible. The exterior fat extends over most of the surfaces and is generally

firm and smooth, but it may be somewhat bunchy; especially over the rumps, loins, ribs and shoulders. The neck and lower part of the rounds, shoulders, and shanks generally have little fat covering them.

The cod, kidney, crotch, and other interior fats are either moderate in amount or somewhat wasty. The interior walls of the fore quarters are only partially covered. The fat is usually firm, brittle, and reasonably white, but may be somewhat soft and have a slight yellowish tinge.

The flesh varies from moderately firm to somewhat soft. The color ranges from a light cherry-red to a slightly darker red. There is some marbling present in the thicker cuts. The weight range is from 350 pounds upward.

4. Medium, or No. 3, is a carcass that has a fair conformation, finish and quality. Usually the conformation is rather rugged and irregular.

In quality this grade represents the middle point between the best and the poorest beef marketed throughout the country as a whole. The rounds are relatively long and tapering. Loins are flat and slightly depressed. Ribs, chucks and plates, although relatively broad, possess average depth of flesh. The neck is quite long and thin; the shanks long and tapering; and the hip and shoulder joints somewhat prominent.

The fat covering is fair over the back, but very thin or entirely absent over a large part of the rounds, chucks, neck and shanks. There is a small amount of cod, kidney, and crotch fat, and the kidneys are usually only partially covered. All fats have a yellow tinge.

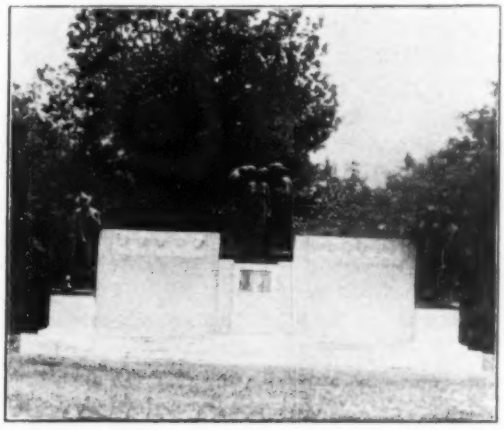
The flesh throughout the carcass is of average thickness, somewhat soft, and has a slightly dark red color, with little or no marbling, depending upon the finish. Usually the cartilages are hard and white, and the bones gray or white and flinty. This does not apply to those animals under four years of age which fall into this grade. The "eye" lacks the depth noticed in the better grades. The weight range is from 350 to 570 pounds.

5. Common, or No. 4, is a carcass that has poor conformation, finish and quality. The outlines are irregular, angular and rangy. The bones are prominent and the ratio of bones to flesh is high. The hip and shoulder joints are conspicuous; chucks and plates relatively wide and thin; ribs flat; loins thin and shallow; and the rounds, neck and shanks are long and thinly fleshed.

A carcass of this grade has very little fat covering and this is limited to a thin layer on the loins and ribs. The fat is soft and yellowish white. There is very little cod, crotch and kidney fat. The "eye" is decidedly lacking in size, indicating a deficient covering of flesh throughout the carcass. The flesh is soft and watery and has

DEDICATED TO WAR HEROES

This monument, in Shiloh National Park, near Memphis, was erected by the Daughters of the American Revolution to commemorate the heroic dead of both sides and to show that the sacrifices of these heroes have welded the states into a firm union. Shiloh National Park is situated on high bluffs of the Tennessee River near two of the large TVA dams. Its grounds are large and spacious, covering many acres, and its scenic beauty is unexcelled.



a dark red color. The weight range is from 300 to 550 pounds.

6. Cutter, or No. 5, is a carcass with very poor conformation, finish and quality. The rounds are long, very thin and sharply tapering; loins very thin and shallow; ribs very thin and flat; chucks and plates very thin, broad and shallow; and neck and shanks very long and thin. All bones are prominent.

The only fat on the exterior surface is a thin covering along the back. Interior fats are limited to traces around the kidneys, and in the crotch. The flesh is very soft, watery and dark.

This grade of beef usually comes from ill-shaped, emaciated steers, as a result of poor feeding, improper breeding and old age. Because the flesh is so thin and the ratio of bone to flesh so high, most of the carcass is boned out and either sold as boneless cuts or cured and used in sausage.

7. Low Cutter, or No. 6, is a carcass that has extremely poor conformation, finish and quality. Because of the thinness of the flesh, all bones are prominent. Usually there are no visible exterior or interior fats. The flesh is extremely soft, watery, and very dark. This is the lowest type of beef recognized by the trade.

Carcasses in this grade are so deficient in flesh and fat that they can not be sold in retail cuts, but are boned out and used either for canning or sausage.

DESCRIPTIONS OF DRESSED POULTRY

Descriptive terms, as applied to beef, are also helpful in the grading of dressed poultry. In describing the grades of dressed poultry, I shall consider the specifications for individual birds.

U. S. Special, or U. S. Grade AA: A bird under this classification must be a mature, fine-grained female, with a broad, full-fleshed breast. The entire carcass must be covered fully with fat. The skin must be soft and glossy and lie close to the flesh. The carcass must be well bled, well dressed and free from pinfeathers.

No skin or flesh bruises are allowed. Only very slight skin abrasions or discolorations are permitted, none of which may be on the breast. No crooked breasts or other deformities are allowed. A broken or disjointed wing above the wing tip or a broken or disjointed leg is not permitted. Scaly legs and excessive abdominal fat are also prohibited.

The bird must be dry picked or semi-scalded, and dry packed. The maximum weight in this class is three pounds—36 pounds in dozen lots.

U. S. Prime, or U. S. Grade A: A bird in this class must be a mature, fine-grained female and must have a well-fleshed breast. The entire carcass must be covered with fat, and the skin soft and glossy. It must be well bled, well dressed and practically free from pinfeathers.

No flesh bruises and only very slight skin abrasions or discolorations are permitted, none of which may be on the breast. Crooked breasts or other deformities, broken wings above the wing tips, or broken legs are not allowed. Torn skin is not permitted, nor sewn skin on the breast or fleshy part of the carcass, but slight, sewn tears are permitted on the back. Birds with crops properly removed and sewn may be included in this grade. The carcass must be dry picked or semi-scalded, and it must be dry packed. The weight range is from three pounds to four pounds and 15 ounces, and in dozen lots from 36 pounds to 59 pounds.

U. S. Choice, or U. S. Grade B: In this class is the mature female, with a fairly well-fleshed breast and a carcass fairly well covered with fat. It must be fairly well bled and dressed and may show a few scattered pinfeathers over the entire carcass. Slight flesh or skin bruises, abrasions or discolorations are permitted, but not more than three such defects are allowed if on the breast. Abrasions or tears over two inches in diameter are not allowed, unless properly sewn up.

Dented or slightly crooked breast bones or other slight deformities are permitted. One wing or leg broken in the flesh is allowed, provided the bone does not protrude through the flesh or show excessive bruise or blood clot. The weight range for an individual is from five pounds to five pounds and eight ounces, and in dozen lots from 60

to 65 pounds, the average being 62½ pounds.

U. S. Commercial, or U. S. Grade C: A bird in this class is a mature female with a poorly fleshed breast and carcass poorly covered with fat. It may show evidence of poor bleeding and have numerous pinfeathers over the entire carcass. Abrasions and discolorations, and hunch backs or other deformities are permitted, if the bird is fairly well fleshed.

Those bruised so badly that an appreciable part is inedible and those which are emaciated or show external evidence of disease are not included in this grade.

The terms used in grading individual carcasses have some variation when applied to other classes such as broilers, fryers, roasters and individual males. Too, there exists a difference in the various weights.

CONCLUSION

When the foregoing descriptive terms have been applied properly in the grading of dressed beef or poultry and when the other factors such as conformation, finish and quality have been rigidly observed, the consumer can be confident that he is receiving the grade and quality for which he is paying.

SOURCE OF DATA

Bulletin No. 1246 of the U. S. Department of Agriculture, and *Classification and Tentative Specifications for U. S. Standards and Grades for Dressed Chickens*, issued by the U. S. Bureau of Agricultural Economics, have guided the writer in this presentation.

Antitoxic Chemotherapy

A NEW avenue for attacking microbic infections was opened when, in 1937, Lediviti and Vaisman[1] demonstrated for the first time the coming of a veritable antitoxic chemotherapy comparable to the serotherapy which came into being with the development of micropathology, with the coming of the Pasteurian era of medicine.

In having demonstrated that the sulfurated benzenes, of which popular sulfanilamide is an example, are antiendotoxic as well as antimicrobic, these authors and their contemporaries have brought toxin neutralization *in vivo* within the scope of understandable processes.

The work of L and V was conducted on laboratory mice, injected intraperitoneally with cultures of gonoccoci to which mucin was added. In the mice that died from the experimental injections in 18 to 48 hours, either from gonococcic peritonitis or from endotoxic intoxication, the peritoneal cavity, particularly in the latter event, no longer contained the organisms. These had undergone complete lysis before death occurred and thus opened the way for the study of the action of these chemical agents on the bacterial toxins.

In a later study, these authors[2] extended their investigations to the endotoxins of other microbic pathogens: meningococci and other organisms of importance in comparative pathology.

The conclusion reached from this work is that the antiendotoxic action of the sulfamides is quite general. That is to say, medicine must now reckon with chemotherapy as well as serotherapy in neutralizing the toxins of bacterial infections.

While the mechanism of this anti-infectious chemotherapy is far from being clearly demonstrable from the strictly chemical point of view, these researches have led to the belief, if not to the proof, that these sulfamides do not annihilate the toxigenic function of endotoxins but act indirectly after submitting (*in vivo*) to modifications in their chemical constitution. *Principle X*, the name given to the modified agent, may act through oxydo-reduction phenomena, which may play an effective rôle in the chemical detoxification of certain toxigenic groups of the protein molecule or the glucido-lipids of endotoxins.

Supporting the "principle X" hypothesis of the action of these agents is their feeble bacteriostatic power *vis-à-vis* their remarkable curative effect in bacterial diseases.

[1] C. Lediviti and A. Vaisman, Compte Rendu, Académie des Sciences civ (1937), p. 1108.

[2] *Ibid.* La Chemotherapie Antiendotoxique. Annales de l'Institute Pasteur, lxi (Dec., 1937), pp. 635-661.

L. Enos Day

(1865-1939)

Secretary L. Enos Day, of the United States Live Stock Sanitary Association, died of a heart attack at his home in Chicago, May 19, 1939. Known to have been hail, hearty and active in his secretarial work, his death came as shock to his multiude of colleagues, many of whom attended the funeral ceremonies to pay homage to their departed friend.

Doctor Day was born at Melbern, Ohio,

L. Enos Day

June 20, 1865, and graduated at the Ontario Veterinary College, University of Toronto, with the class of 1892. With the exception of five years in general practice in Kansas, following his graduation, he spent his professional life in the service of the federal government, until 1935 when he was retired for age, only, however, to take over the office above mentioned which had been vacated by the resignation of the late O. E. Dyson. His last labor for the veterinary service was the publication of the 42nd annual report of that Association which, needless to say, exemplifies the zeal of its editor.

In the government service, he won distinction for his fruitful contributions to the literature on difficult subjects of great interest to the live stock industry and veterinary medicine. His work in helminthology and on controversial phases of bovine tuberculosis and on certain rare tumors represents the depths of his creative mind. In fact, a brief survey of the biography of such indefatigable figures as Day, Niles, Dorset, Hall, Ransom, Cotton, McBryde *et al*, not to mention their tireless chiefs, explains the reason why the world of science points out the Bureau of Animal Industry, United States Department of Agriculture, as a remarkable organization.

Hard work without remission, devotion to duty and achieving without fanfare typify the life of L. Enos Day—friend, scholar, teacher, author, whose private and professional life stands out as a pattern to be praised with mingled respect and affection.

The appraisal of his standing among pathologists is attested by the certificate of honor granted to him by the American Medical Association and his election to the presidency of the Chicago Pathological Society in the heyday of his activities.

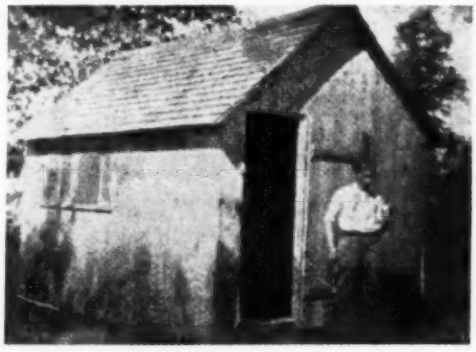
In addition to participating in many of the major projects of the Bureau through the years of its development and pursuing investigational work in the West Indies and Central America, Doctor Day taught meat inspection at the Chicago Veterinary College (1907-1912) and in 1917, when the elected secretary of the A. V. M. A. went to war, he volunteered to serve as acting secretary, an office he filled with outstanding success. The increase of membership during his tenure stands out in bold relief on the records of the Association.

L. A. M.

EDITORIAL

"Hogs Died Like Flies"

UNDER this revealing headline, *Wallaces' Farmer and Iowa Homestead* for April 22, 1939, pays tribute to three government employés and the veterinary service of this country by pointing out how Dorset, Niles, and McBryde, since 1914, saved 100,000,000 hogs for the farmers of the Cornbelt by discovering a reliable method of immunizing hogs against cholera by ten years of painstaking research. They shackled the tiger—hog cholera—and forever removed that despairing hazard of swine breeding. It was the hazard, known since 1833, that was killing 130 out of every 1,000 hogs the farmers raised.



Taken in 1905, this picture shows Dr. McBryde standing by the door of the shed on Skunk River where hog cholera was shackled. Years later he returned to take charge of the modern field station erected on the same site.

On farms where the disease struck "like lightning" it sometimes killed 99 out of every 100. "Carcasses were piled up like cordwood. . . . When anybody says that folks on the public payroll don't produce anything, tell him about Marion Dorset, W. B. Niles, and C. N. McBryde," the author admonishes, "and they didn't get a nickel profit for it. They received only their moderate pay as such workers for the United States Department of Agriculture. And they would have got that anyway. . . . Dorset patented the process—just to make sure nobody tried for a monopoly—and then gave the patent to the nation."

The author reminds the reader of the terrific epizoötics of 1887, 1897 and 1913 and points out that the tiger is chained only where farmers use the process this triumvirate of government scientists have placed in their hands, as "The tiger—hog cholera—still lives. . . . The unknown thing

Left to right: W. B. Niles, Marion Dorset, and C. N. McBryde.

that makes the disease still rages. If all of the serum in the United States were wiped out tomorrow and no more were produced all summer, we could still have millions of hogs dead of cholera before the next frost." Otherwise stated, "chaining the tiger" is in the farmers' hands.

To keep history in order, it is necessary to mention here that the work which led to the discovery of hog-cholera vaccination began in 1897, when Chief Salmon sent Marion Dorset to Sidney, Iowa, during the raging epizoötic of that year, to test a serum made from the historic "hog-cholera bacillus." The negative results led up to the investigations of 1903, when Dorset was joined by Niles and McBryde. This trio soon discovered that blood obtained by tail-bleeding contained no figured organism and yet, caused death when injected into well hogs. However, if the experimentally infected hogs were injected simultaneously

with the blood of immune hogs (recovered cases), they lived and resisted natural exposure.

How this initial evidence led to hyperimmunization and vaccination on a large scale is well known veterinary medical history. The year 1907 is given as the time when the first large-scale test of the process was made on Iowa farms by these intrepid investigators; 1897 is the year the investigation began. What this decade (1897-1907) has meant in the conservation of farm property is truly tremendous but its meaning in medical research in general is still more important. It clarified the study of virus diseases to a remarkable extent and, needless to remind veterinarians, in addition to cholera it fathered our knowledge of other swine diseases.

The veterinary profession can agree with the author, where he says: "Three men tied the tiger up. And farmers, who go to Lincoln's tomb at Springfield or Grant's old home at Galena, might make a pilgrimage also to Sidney, Iowa, and to Ames, where these three learned how to do it, and finally did do it. These are historic spots, too."

At the Age of Seventy-Six

FEW scientific societies in this or any other country can look backward over 76 years of uninterrupted progress or over a life as full of achievement as that of the A.V.M.A., a membership in which has become an outstanding mark of distinction and of merit. Yet, when 40 veterinarians from the upper cadre of that day met in New York City on June 16, 1863, they founded such a society. These "40 of '63" are the ancestors of organized veterinary medicine in this country—on this continent. On that date they took over a responsibility that their successors never shirked for a moment. The motive was to guide veterinary science upward and to guard its application by developing a college-trained personnel which did not then exist. They chose wisely a membership that would forever prevent the taking of retrogressive steps.

The society they founded was to live and to grow despite the great obstacles there were to overcome. There was an educational system and a profession to establish, where none had existed before, in a vast agricultural country which at that moment was depleted by gigantic military operations.

These ancestors started a society that was to expand into a large, international fraternity and they inspired, with parental admiration, the forming of state associations and their local subsidiaries, all of the while governing the development of animal medicine without a notable setback or stain upon its records.

In short, whatever standards the profession enjoys are gifts of the A.V.M.A., of these "40 of '63" and their chronological successors. The official roster of 1939 carry on as usual, hopeful that all eligible members of the profession will seize the one opportunity they have of keeping their vocation in order.

At the age of 76, the A.V.M.A. is the largest society of its kind. But, inasmuch as its responsibilities are increasing and its projects are multiplying, it is becoming more and more important for all concerned to participate in its labors, and not go on disappointing the "40 of '63" by staying outside.

In surveying the projects proposed by the Reorganizing Committee and matching these with the available funds and the potentiality resting with the non-members, it is evident that with a membership of seven to eight thousand, there would be little to fear about the future of veterinary medicine in this country. It has a historically conservative organization full of sensible ambition and well deployed to do the work, but it must have sufficient earnings to furnish the necessary funds. The A.V.M.A. will not go backward. Its history insures that. But the speed of the advancement is slowed up somewhat because too many eligible veterinarians do not contribute to its budget. Whatever the veterinary profession is, or will be in the near future, depends a great deal upon the thoughtfulness of the veterinarians who do not belong to the Association.

World's Poultry Congress, A. V. M. A. Day

THE SEVENTH World's Poultry Congress, which will convene in Cleveland July 28 to August 7, will attract delegates and visitors from all over the world, bringing with them not only governmental and educational exhibits, including 10,000 live birds, but also contributing scientific papers on pathology, genetics and nutrition.

This is the first, and perhaps will be for the next few generations the last, World's Poultry Congress to be held in the United States. It represents unquestionably the greatest agricultural exposition and array of scientific minds that have ever been brought together in the history of the present world. Pre-Congress estimates indicate that more than 500,000 people from all over the world will attend. Close to 200,000 paid memberships have already been sold in this country alone, and 600 exhibitors have bought space.

Wednesday, August 2, has been designated as A.V.M.A. Day and under the dynamic chairmanship of Cliff D. Carpenter of Fort Wayne, Ind., it promises to be one of the outstanding features of the exposition. Following is the program that has been arranged for this day at the Congress:

Morning

Attending the Section 3 "Pathology and Disease Control," at which time Drs. Brandly, Dobson, Rudolph, Beaudette, Schaaf and Coles from Michigan, England, Germany, New Jersey, Germany and South Africa, respectively, will cover subjects including "The Use of Chicken Embryo in Poultry Disease Studies," "Newcastle Disease," "Treatment of Coryza and Tracheitis in Fowls with Chlorine Gas," "Respiratory Diseases of Birds," "Trichomonads as Excitants of Disease in Poultry" and "Pullorum Infection in Fowls."

Noon

Luncheon meeting at Hotel Carter, with expected attendance of 500 or more veterinarians.

Afternoon

A specially planned program, attendance being confined to veterinarians, at which time the general theme will be "A Broad Treatment of the Problems in Poultry Practice." The speakers for this program have been tentatively selected and their subject matter includes:

1. Today's preparation of the veterinary student for poultry practice.
2. Value of research in avian pathology to the practitioner.
3. The specialist in poultry practice.
4. Poultry problems of a general practitioner.
5. The importance of sound breeding, management and nutrition programs in maintaining resistance against poultry diseases.
6. Where do we go from here?—A symposium on improving relationships with the leaders of the poultry industry to the benefit of the general practitioner.

Evening

Veterinarians will attend the "All States" banquet, one of the important events of the Congress.

The exposition includes altogether too many high spots to be seen in one day. Most folks are planning to spend a minimum of three days in Cleveland, and veterinarians are urged to plan either to remain over Thursday or to come a day early and remain for the three days—Tuesday, Wednesday, and Thursday, if possible. The pathology programs of the Congress alone on the day before and the day after A.V.M.A. Day will many times repay the extra expense and time.

The Hotel Carter, right in the heart of Cleveland, has been designated headquarters for the Association. Room accommodations for veterinarians arriving on Tuesday or remaining over Wednesday night should be applied for at an early date. Every hotel in Cleveland is being reserved for the Congress and veterinarians should

write to Mr. Ed. Brennan, 1604 Terminal Tower, Cleveland, Ohio, and indicate A.V.M.A. affiliation, asking for assignment to the Hotel Carter.

Hotel Carter advises that all of their single rooms and twin-bedded rooms for two people have been taken for the duration of the Congress, leaving double rooms with double bed for two people, at the rate of $5 and $6 a day. Thus, veterinarians who will attend for one, two or three days should apply for these rooms immediately. Those expecting to attend for the duration of the Congress, however, may still apply to Mr. Brennan.

A $10.00 membership book, now on sale in all states by Congress committees, may be exchanged for a family membership allowing a veterinarian and his wife or other member of his family full admission to the Congress for the entire eleven-day period, including the scientific sessions daily and other restricted functions which are being limited to foreign delegates and full Congress membership. In addition, this $10.00 membership includes a $5.00 official report of the proceedings of the Congress, which will give the English translation of all the scientific papers presented on pathology and disease control, genetics and nutrition. Also is included one official Congress catalog.

The method of securing these memberships is as follows: Write to Dr. M. A. Jull, Secretary, World's Poultry Congress Membership Committee, University of Maryland, College Park, Md. Ask for a membership application form, fill out the form and return the application to Dr. Jull with the book of ten membership certificates, which may be purchased from your local or state Congress Committee; or, send Dr. Jull, with this application, your check for $10.00. He will promptly send you the full membership card, which is your admission to general and special events, and your copy of official proceedings will be mailed you.

Those wishing to attend only the noon luncheon and the afternoon program will pay no Congress fees. Single admission to the grounds is 50 cents, permitting attendance at the popular lectures and visits to the live stock exposition.

The Scientific Exhibits of the A. M. A.

IF ONCE scientific exhibits were the prosaic *tache* of medical conventions, they are now regarded as one of the major attractions by the American Medical Association. An editorial* in that association's official organ, outlining the program of the Saint Louis session, held last month, declares that this feature is "a magnificent postgraduate opportunity not available in any other way. . . . The popularity of this feature of the session is attested by the fact that many physicians spend almost their entire time during the week in the scientific exhibits."

By mutual consent between management and exhibitors, the scientific exhibits of A.M.A. conventions have been improved through the years and, today, are a veritable exposition of the material employed in the practice of medicine that has no parallel for completeness and educational value. To enhance the latter, representatives of the exhibitors are invited to present manuscripts to the sections concerned, describing the usage of their exhibits, in other words, defending them before a critical audience. The arrangement indicates the trend in the art of medicine, the *raison d'etre* of medical research and invention.

The A.M.A., the largest and certainly the most influential medical society in the world, is the physician's haven not only at conventions, but always. Its interest in what the physician uses in his daily work is but one of the examples that account for its popularity and influence. The new relations between the A.V.M.A. and the exhibitors' association are, therefore, a step forward.

Executive Board Elections

The regular elections for members of the Executive Board in Districts 4 and 10 are now in progress and will come to a close on June 28. Those who are successful in these elections will take office at the close of the Memphis meeting, and will serve for terms of five years each. If you have not sent in your ballot, do so at once.

*Jour. Amer. Med. Assn., January 7, 1939.

Liability Insurance

THE WORLD has become liability-minded—lawsuit-minded, to be more explicit. No one can gainsay that this is not the truth. The tremendous loss of life, limb and property from automobile accidents on the highways and streets is the cause of this mental attitude. The quest for protective insurance has become almost universal. Few owners of cars take their own risk. But universal insurance of car owners has also inculcated the habit of bringing action in court for damages on every conceivable provocation and in every walk of life.

No one, now a days, is exempt from lawsuits for damages. In the practice of our branch of medicine accidents are apt to occur which lead clients to believe that their animals were lost or injured through alleged negligence; and, whatever may be the merits of the case, a defense must be made at considerable cost and embarrassing publicity.

For these reasons, the A.V.M.A. maintains a dependable liability insurance service for its members through a reliable insurance company (see page xxii). The service is for members only and the policies are issued only on the recommendation of the central office of the Association. The risk of paying damages of considerable proportions through unavoidable accidents or the whims of judges and juries, not to mention the unfortunate publicity that lawsuits always bring, were the reasons for establishing this service for the membership. No insurance company other than ours issues this kind of insurance. Considering the kind of risk the policies cover, the premiums are trivial. Write the agents or this office for particulars.

Changes in the Central Office

A MEMBER writes: "No doubt the Executive Board has acted as it thought best in changing the personnel of the secretarial and editorial work of the Association, but don't you think the members should be informed when such changes are made? I notice that no mention was ever made of Dr. Hoskins' resignation."

The answer is that according to the judgment of the present management, the proper time and place to discuss matters of that genre is before a stated meeting of the House of Representatives.

It might also be said that the reformation is more far-reaching than a mere change in personnel. The changes embrace reorganization of the central office personnel, the improvement in the contents of the JOURNAL, the prompt response to correspondence and acknowledgment of manuscripts, the increase in the advertising value of the JOURNAL, the enlargement of the membership, prompter payment of dues, the careful selection of articles covering each branch of the service and, lastly, modern customs in the literary and mechanical makeup of a scientific periodical. The making of these changes within the resources of the Association is the outgrowth of a long-time study of the needs of organized veterinary medicine by the Reorganizing Committee, composed of H. W. Jakeman, H. D. Bergman, O. V. Brumley, and Cassius Way.

Ethics in Consultations

A NEW member, whose name is withheld on request, relates a personal experience deserving the attention of the Committee on Public Relations. Quoting:

> In handling a disease that was difficult for me to diagnose to a certainty, it was decided that a consultation would be advisable. The owner suggested the farm adviser, who is a good friend of mine, and a veterinarian from the state university . . . Contrary to the usual custom, these experts made their examination in my absence and gave their report direct to the owner. Their opinion did not suit the owner as well as my own and it left me in the embarrassing position of contradicting a colleague from a high source. . . . The result of this consultation was that the owner not only lost three horses but also his confidence in the farm adviser, the university veterinarian, the veterinary profession and me. He thought we did not know our business and said so. . . . Does

the Association pay any attention to such personal experiences?

The code of ethics is clear in this respect. Consultants are expected to give their opinions to the client through the attending doctor and in no other fashion. The object is more far-reaching than is generally believed. The main intent is not to protect the attending doctor against criticism but more particularly to prevent the unfavorable impressions which conflicting opinions are sure to engender in the minds of intelligent clients. The science of medicine is not as exact as an adding machine and, as a consequence, difference of opinion may not be comprehensible to the most intelligent person not medically informed.

In answer to the direct question "Does the Association pay any attention to such personal experiences?" one needs only to recall the conditions of the past in this connection. Once upon a time, not so far distant, every consultation was a fight between two doctors, in which the most opprobrious adjectives of their vocabulary were mobilized to defame one another. While this has been replaced largely by a spirit of coöperation, the incident related above shows that such controversies still occur in modified, but in no less harmful, form. Fortunately, they have become comparatively rare, thanks to the doctrines of organized veterinary medicine, which aim to cultivate fraternalism in our somewhat disconnected disease-fighting mechanism.

Public, private or commercial consultants can not abolish the code on consultations without demoting their calling and themselves. It's the old story of the two cooks and the poor soup, told here and *absit invidia*.

Commercial Feeds and Forage.

An editorial in the *Poultry Tribune*, outstanding mouthpiece of the poultrymen, draws attention to the "undeserved criticisms" of commercial poultry feeds. Quoting:

> In practically every case where a ready-mixed feed did not come up to the specifications, it proved to be the product of the small mixer who, perhaps innocently, because of lack of control over ingredients, was robbing his mixture because the ingredients he was purchasing were themselves not up to specification.

Otherwise stated, the large manufacturer with facilities for checking the quality of the ingredients and the food value of the finished product is more apt to provide the consumer with the kind of ration poultry require. Although the effect of a food on chickens is more quickly apparent than in the other species of animals (dogs, cattle, horses, hogs), the same situation obtains without exception throughout the whole domain of animal production. The only difference is that a poor feed more quickly disqualifies itself in poultry than in the slower-growing species. The maze of digestive troubles, nutritional disorders, stunted growth, or low egg production, not to mention the infections that harrass avian life at every stage, are quickly observed when the ration is deficient. A brood of chicks, a pen of broilers, or a flock of layers are never slow in showing the effects of nutritive insufficiency.

In degrees, perhaps less outwardly expressed, these principles run parallel in dog foods. Where an abundance of good material is lacking, where a trained personnel for testing ingredients is not employed, and where the physical equipment for manufacture is below par, uniform values of the finished product can hardly be expected, in the absence of supervision such as the American Medical Association maintains for prepared human ailments and the American Veterinary Medical Association, in coöperation with the American Animal Hospital Association, proposes to carry out for the various brands of foods for pet animals that are flooding the marts of trade.

In view of the avalanches of mixed feeds going out to the public unsupervised, the proposed project of establishing a "Council of Foods and Forage" by the A.V.M.A. comparable to the one already started by the A.A.H.A. for pet animals is certainly worthy of thoughtful consideration.

APPLICATIONS

UNPRECEDENTED enthusiasm in Association activities on the part of the deans of the colleges and state secretaries accounts for the meteoric increase in the number of applications filed during the past two months. Right now it seems certain that within the next twelve months the membership roll will be augmented by more than 1,000. This prediction is not based on a hope or a vague statistic. Rather, it represents an imperative, because only through the support of the majority of the profession can organized veterinary medicine serve to the best advantage.

First Listing

(See January, 1939, JOURNAL)

ANDBERG, WILLIAM GUST
Highland Road, West Concord, N. H.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and W. F. Guard.

ANSLOW, RALPH O.
221 Post Office Bldg., Salem, Ore.
B. S., D. V. M., Washington State College, 1938. Vouchers: E. E. Wegner and Sherman L. Brown.

BAER, RICHARD EDWARD
734 Wilson Ave., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

BARNER, RALPH DAVID
2740 Newbern St., Youngstown, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and W. F. Guard.

BARRETT, FRANCIS G.
Reynoldsburg, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and W. F. Guard.

BATCHELDER, GEORGE DALLAS
Box 294, Yazoo City, Miss.
D. V. M., Alabama Polytechnic Institute, 1935. Vouchers: Hartnell Robbins and T. W. Boman.

BEASLEY, WILLIAM RALEIGH
109 Toomer St., Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1939. Vouchers: R. L. Mundhenk and F. P. Woolf.

BECKMAN, FRANCIS WILLIAM
1001 S. Monroe St., Spokane, Wash.
D. V. M., Colorado State College, 1921. Vouchers: R. A. Button and J. D. Manges.

BEERE, MERRITT HENRY
43 Country Club Road, Waterbury, Conn.
V. M. D., University of Pennsylvania, 1933. Vouchers: G. LeRoy Cheney and Jean V. Smith.

BERGER, JOSEPH HERMAN
Route 1, Box 80, Mishawaka, Ind.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and C. R. Donham.

BLAIR, ADDISON
7147 S. Indiana Ave., Chicago, Ill.
D. V. M., Kansas State College, 1934. Vouchers: Forrest O. Cox and John S. Bengston.

BOYER, PAUL E.
Route 4, Ashland, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

BRANCH, LEMUEL A.
Franklin, Va.
V. M. D., University of Pennsylvania, 1939. Vouchers: M. A. Emmerson and John D. Beck.

BROWN, GUY C.
Hudson, Iowa.
D. V. M., Iowa State College, 1933. Vouchers: F. F. Meads and Earl D. Hubbard.

CAMPBELL, HUGH BURKETT
Geneva Veterinary Hospital, Geneva, Ind.
D. V. M., Kansas State College, 1938. Vouchers: Edwin J. Frick and J. O. R. Campbell.

CLEM, JR., WESLEY ALLEN
Randolph Rd., Meadowbrook, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: F. E. Lentz and John D. Beck.

COOPER, CHARLES NEWTON
Bainbridge, Ga.
D. V. M., University of Georgia, 1932. Vouchers: Chas. C. Rife and J. E. Severin.

COOPER, HAROLD YOUNG
Titusville Rd., Union City, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: Harry K. Royer and John D. Beck.

CRISWELL, EDWARD D.
King City, Mo.
D. V. S., Western Veterinary College, 1904. Vouchers: Ashe Lockhart and William H. Bailey.

CROSHAW, RYLAND
Wrightstown, N. J.
V. M. D., University of Pennsylvania, 1939. Vouchers: F. E. Lentz and John D. Beck.

DELAY, PAUL D.
State Poultry Pathological Lab., Balboa Park, San Diego, Calif.
D. V. M., Iowa State College, 1934. Vouchers: R. W. Gerry and W. L. Harter.

DEVARENNES, CHARLES M.
31 Bridge St., Quincy, Mass.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and W. F. Guard.

DICKASON, RUSSELL B.
Wellington, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: Leonard W. Goss and W. R. Krill.

DORFMAN, SAM H.
114-12A Boulevard, Rockaway Beach, L. I., N. Y.
D. V. M., Alabama Polytechnic Institute, 1939. Vouchers: R. L. Mundhenk and F. P. Woolf.

DOYLE, LEO PHILIP
Purdue University Agr. Exp. Station, W. Lafayette, Ind.
D. V. M., Michigan State College, 1931. Vouchers: R. A. Craig and A. L. Delez.

EDMUNDS, JR., ARTHUR LOWELL
229 Franklin St., Franklin, N. H.
V. M. D., University of Pennsylvania, 1939. Vouchers: A. Henry Craige, Jr. and John D. Beck.

ELSASSER, DAVID S.
13731 Madison Ave., Lakewood, Ohio.
D. V. M., Ohio State University, 1935. Vouchers: N. L. Siplock and Solon Gillen.

EVANS, MILTON R.
3835 E. Eleventh St., Long Beach, Calif.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

FINNEY, E. MALCOLM
Cedarville, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

FOX, CHARLES WILLIAM
Sycamore, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

FRAUSTRO, ALBERTO
Av. Rep. Guatemala No. 110, Mexico, D. F., Mexico.
D. V. M., Universidad de Mexico, 1927. Vouchers: Fernando Camargo and E. A. Rodier.

FULLER, HOWARD K.
Interlaken, N. Y.
D. V. M., Cornell University, 1932. Vouchers: C. E. Hayden and E. Sunderville.

GIBBS, DAVID EDWARD
c/o Alpha Psi, Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1939. Vouchers: I. S. McAdory and R. L. Mundhenk.

GLASS, SHERMAN A.
2769 Lancashire Rd., Cleveland Heights, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: R. E. Rebrassier and W. F. Guard.

GRIFFITH, AARON RUFUS
Thomasville, Ga.
D. V. M., Alabama Polytechnic Institute, 1931. Vouchers: Glen H. Randall and S. D. Hobbs.

HAMBROOK, GORDON D.
c/o Dr. W. E. Howe, Box 1086, Sacramento, Calif.
D. V. M., Washington State College, 1933. Vouchers: G. W. McNutt and N. G. Covington.

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1627 Highland St., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and R. E. Nichols.

HARGETT, LE GRAND JONES
233 Washington, Yazoo City, Miss.
D. V. M., Alabama Polytechnic Institute, 1916. Vouchers: Hartnell Robbins and Leonidas L. Denson, Jr.

HARRIS, WILLIAM KENNETH
2239 Neil Ave., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: Leonard W. Goss and W. F. Guard.

HATHAWAY, JAMES HOWARD
111 Ranch, Mammoth, Ariz.
D. V. M., Colorado State College, 1939. Vouchers: A. W. Deem and Frank Thorp, Jr.

HAY, JAMES ROBERT
439 Oakland Park Ave., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: R. E. Rebrassier and C. R. Donham.

HELLER, OLIVER PERRY
Waterville, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: R. E. Nichols and W. F. Guard.

HENSON, BENJAMIN S.
1948 Iuka Ave., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: R. E. Nichols and W. F. Guard.

HERRON, JAMES THOMAS
121 S. Central Ave., Canonsburg, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: William J. Lee and John D. Beck.

HISGEN, JOHN D.
1436 W. Garfield Blvd., Chicago, Ill.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

HOFFMAN, WILLIAM F.
18 N. 18th St., Harrisburg, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: William J. Lee and M. A. Emmerson.

HOLT, RUSSELL DEARBORN
8 King Ave., Medford, Mass.
V. M. D., University of Pennsylvania, 1939. Vouchers: A. Henry Craige, Jr. and John D. Beck.

HOUDESHELL, EDGAR MARTIN
c/o Preble Co., Lewisburg, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

HOUSER, RAYMOND R.
Route 4, Findlay, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. R. Krill and C. R. Donham.

HOWELL, WELLING CLIFFORD
Summit Ave., West Trenton, N. J.
V. M. D., University of Pennsylvania, 1939. Vouchers: William J. Lee and M. A. Emmerson.

HUSTON, BEN STEPHEN
329 W. Magnolia St., Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1939. Vouchers: R. L. Mundhenk and F. P. Woolf.

JAMES, HAROLD DAVID
Route 1, Yellow Springs, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and W. R. Krill.

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D. V. M., Alabama Polytechnic Institute, 1939. Vouchers: R. L. Mundhenk and F. P. Woolf.

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Route 1, Hooversville, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: S. F. Scheidy and John D. Beck.

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4701 Ramona Ave., Philadelphia, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: A. Henry Craige, Jr. and John D. Beck.

KROLL, HARRY MENKEN
Wittel Dormitory, Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1939. Vouchers: R. L. Mundhenk and W. E. Cotton.

KUHN, IRVIN E.
Beaver Falls, Pa.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

LADSON, JACK A.
Olney, Md.
V. M. D., University of Pennsylvania, 1939. Vouchers: G. A. Dick and John D. Beck.

LANDIS, PAUL FRANK
Route 3, Lancaster, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: Harry K. Royer and John D. Beck.

LEWIS, J. HYLAN
University of Pennsylvania, Philadelphia, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: A. Henry Craige, Jr. and John D. Beck.

LISOWSKI, THADDEUS E.
30 Spruce St., Cranford, N. J.
D. V. M., Ohio State University, 1939. Vouchers: J. W. Mills and W. F. Guard.

MCBRIDE, DAVID BRYANT
Saint Clairsville, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: R. E. Rebrassier and W. F. Guard.

MCCARTHY, DANIEL F.
501 S. E. 5th Ave., Moultrie, Ga.
D. V. M., Kansas City Veterinary College, 1918. Vouchers: S. D. Hobbs and Glen H. Randall.

MARSH, RALPH WALDO
Box 288, Auburn, Ala.
D. V. M., Alabama Polytechnic Institute, 1939. Vouchers: R. L. Mundhenk and W. M. Howell.

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D. V. M., Ohio State University, 1939. Vouchers: R. E. Rebrassier and W. F. Guard.

MAXWELL, LYLE PADEN
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D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

MELWORTH, SAMUEL
2007 W. 83rd St., Cleveland, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: R. E. Rebrassier and W. F. Guard.

MERRILL, STANFORD DAVIS
South Paris, Me.
V. M. D., University of Pennsylvania, 1939. Vouchers: Chester M. Merrill and John D. Beck.

MICHAELIDES, MICHAEL
218 Forrer Blvd., Dayton, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: C. R. Donham and W. F. Guard.

MILLER, HAROLD K.
Cleona, Pa.
V. M. D., University of Pennsylvania, 1939.
Vouchers: Robert O. Biltz and John D. Beck.

MOSER, SAMUEL HENRY
Morgantown, Pa.
V. M. D., University of Pennsylvania, 1939.
Vouchers: A. Henry Craige, Jr. and S. F. Scheidy.

MUNTZ, KARL HUBER
Holgate, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: C. R. Donham and W. F. Guard.

MURPHY, WILLIAM
c/o Robert Whayland, 129 W. Locust St., Salisbury, Md.
V. M. D., University of Pennsylvania, 1939.
Vouchers: Donald G. Lee and William J. Lee.

PARRELL, HYMAN HENRY
3942 Woolwine Dr., Los Angeles, Calif.
D. V. M., Kansas State College, 1938. Vouchers: Edwin J. Frick and P. E. Johnson.

PECK, EDWARD PORTER, II
162—13th Ave., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and W. F. Guard.

PECK, ELIZABETH NEWKIRK
31 Tenney Ave., River Edge, N. J.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and C. R. Donham.

PHELPS, T. ROBERT
1514 Washington St., Oregon City, Ore.
D. V. M., Colorado State College, 1927. Vouchers: Sherman L. Brown and Chas. H. Seagraves.

PRIMERANO, WALTER D.
43 Grove Ave., New Rochelle, N. Y.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

RAVITCH, MARTIN HERMAN
2023 River Ave., Camden, N. J.
V. M. D., University of Pennsylvania, 1939.
Vouchers: Israel Live and John D. Beck.

REED, WILLIAM NORMAN
University of Pennsylvania, Philadelphia, Pa.
V. M. D., University of Pennsylvania, 1939.
Vouchers: Louis A. Klein and John D. Beck.

REICH, SIGMUND THEODORE
48 W. Norwich, Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: R. E. Nichols and W. F. Guard.

RICKER, J. HENRY
620 N. Pitt St., Carlisle, Pa.
V. M. D., University of Pennsylvania, 1939.
Vouchers: A. Henry Craige, Jr. and John D. Beck.

RIVERS, ERNEST WILLIAM
3 Forest St., Stoneham, Mass.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

ROSS, MARTIN ALLEN
Route 1, Mason, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

SELLERS, ALVIN FERNER
509 N. Center Ave., Somerset, Pa.
V. M. D., University of Pennsylvania, 1939.
Vouchers: A. Henry Craige, Jr. and John D. Beck.

SHALE, MAURICE R.
402 Nostrand Ave., Brooklyn, N. Y.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

SHULTZMAN, LAMONT HILTON
Apple Creek, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and C. R. Donham.

SIMS, WILLIAM FINDLAY
412 E. 4th N. St., Morristown, Tenn.
D. V. M., Alabama Polytechnic Institute, 1932.
Vouchers: D. Coughlin and George B. Bradshaw.

SMITH, GAIL BEVINGTON
Venedocia, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and C. R. Donham.

SPIETH, EMMETT W.
Route 1, Charleston, Ind.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

SPRANKLIN, JOHN WILLIAM, JR.
3020 Garrison Blvd., Baltimore, Md.
V. M. D., University of Pennsylvania, 1939.
Vouchers: William J. Lee and John D. Beck.

SPRUNGER, EARL M.
646 Beall Ave., Wooster, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

STANSBURY, JAMES L.
Athens, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and W. F. Guard.

STERLING, JOSEPH ROBERT
1620 First Ave., New York, N. Y.
D. V. M., Kansas State College, 1938. Vouchers: Edwin J. Frick and Nathan Wernicoff.

STRAWN, WILLARD M.
Route 1, Milford Center, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: J. H. Knapp and W. F. Guard.

SWANGARD, WOLFE MICHAEL
Dept. Vet. Path., College of Vet. Medicine, Washington State College, Pullman, Wash.
V. M. D., University of Munich, 1938. Vouchers: E. E. Wegner and J. E. McCoy.

SWEETSER, ROBERT COOLIDGE
96—18th Ave., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

TACKE, FREDERICK JOHN
347 Southwood Ave., Columbus, Ohio.
D. V. M., Ohio State University, 1939. Vouchers: W. F. Guard and J. H. Knapp.

TALLY, HERBERT SPENCER
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CLINICAL DATA

Fracture of the Mandible and Its Treatment in the Dog

By H. W. JOHNSON, D. V. M., and JAMES FARQUHARSON, D. V. M.
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FRACTURES of the mandible or inferior maxilla more commonly involve the body than the rami. Multiple fractures may occur in the ramus and body simultaneously. Fractures of the rami include those of the horizontal and vertical parts. We have not observed fractures of the coronoid process, and they are reported to be rare.

OCCURRENCE

The most common fracture of the body is symphyseal in character (fig. 1). This is particularly true in young dogs. In old dogs fractures may involve a part of the symphysis and obliquely angle to one side or the other. Angular fractures are commonly found between the corner incisor tooth and the canine tooth (fig. 2). Occasionally fractures are seen in the horizontal ramus just anterior to the carnassial tooth. However, fractures are commonly observed as occurring just posterior to the last molar tooth and at the angle of the ramus. Usually fractures of the body and that of the horizontal ramus are compound, because the oral mucous membrane is torn or perforated. Rarely are they compound by way of the skin. In true symphyseal fractures, particularly in young dogs, the alveolus may not be involved and no loosened teeth will occur.

ETIOLOGY

Fractures of the mandible are a result of direct or indirect violence. Those of the body or in close proximity to the body and those of the angle of the rami are usually caused by direct violence. In some cases the fracture is the result of indirect violence. In the latter, fracture of the rami sometimes results from a blow to the body of the mandible. Fractures may be predisposed by pathologic conditions, such as carcinomas, sarcomas, and cysts, which are relatively rare.

The information elicited from case histories shows that most fractures of the mandible occurring in city dogs are the result of their being struck by automobiles, while country dogs, of the shepherd type, receive these most frequently from kicks when heeling an animal, or by resisting vigorous movements of some animal which they have seized.

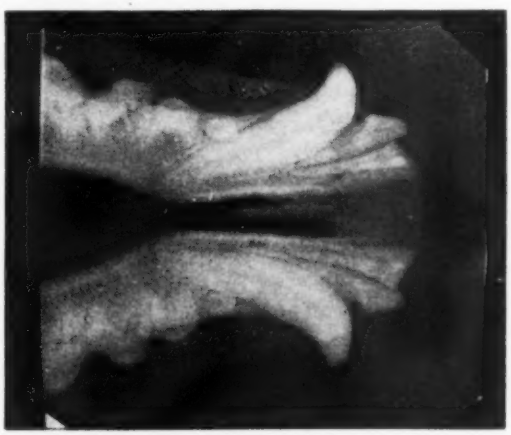

Fig. 1. X-ray, showing symphyseal fracture of the body of the mandible.

Case reports of two dogs that had fallen from second story windows showed different fractures. One received an indirect fracture through the necks of both rami; the other incurred a compound fracture by direct violence through the symphysis. The autopsy of another dog with the history of having been pushed off a cliff revealed a fracture of the angle of the rami complicated with a fracture of the sphenoid

bone. Two case reports with different histories showed that one had received a direct compound fracture of the symphysis and the angle of the ramus from being struck by a car; the other had received identical fractures from being attacked by a large dog.

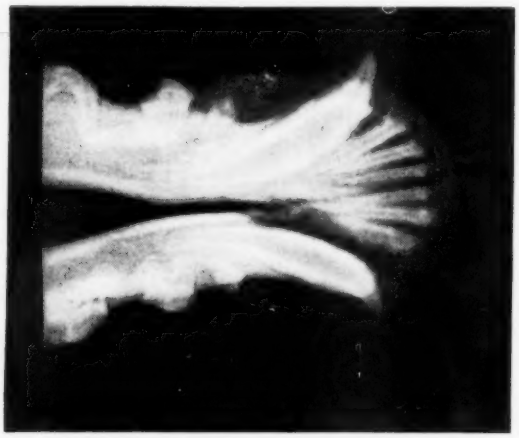

Fig. 2. Angular fracture of the body of the mandible.

DIAGNOSIS

The symptoms of a fracture of the mandible are usually so self-evident that the diagnosis is readily made. There is

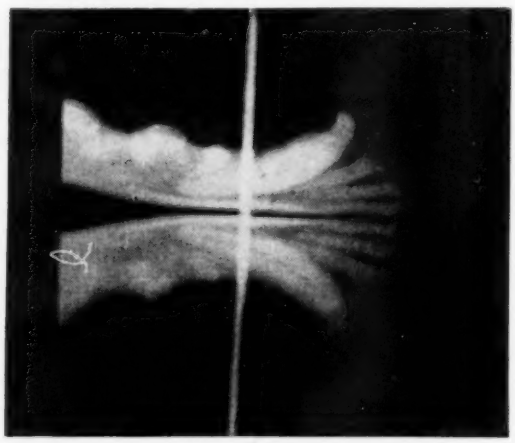

Fig. 3. Symphyseal fracture with Kirschner wire inserted.

evidence of blood, there may be partial or complete loss of function and, if the fracture involves the body, there is a dropping of one side of the mouth. Direct examination of the mouth will usually reveal a fracture. Abnormal mobility and crepitus can be produced in the majority of cases. There is a difference in the level of the teeth, which will vary with the location of the fracture. If the fracture is located in the body, the incisor teeth are out of line, but if the fracture involves the ramus, the jaw will usually drop; and if displacement is present, it will be lateral. In addition, the gums are torn, revealing a compound fracture. The lower fragment is palpable through the cheek. In some cases involving the ramus, the displacement is quite extensive. When the fracture is located between the corner incisor and the canine teeth, the root of the canine tooth is usually exposed.

PROGNOSIS

The majority of fractures of the jaw heal within three weeks. A compound fracture of the symphysis heals readily with proper treatment. Non-union is more common in fractures of the rami. A compound fracture of the rami is difficult to treat because of the bacterial flora in the mouth, the constant bathing of the wound with saliva, and the difficulty involved in keeping the fragments immobilized. If the fracture can not be rendered immobile, infection and ulceration will add to the complications. The lack of proper function causes dental tartar to form quite rapidly, resulting in an offensive odor from the mouth.

TREATMENT

The first essential in treatment is complete reduction of the fragments. The earlier the fragments are brought into apposition and immobilized, the more expedient will repair be accomplished. Under complete anesthesia this is accomplished by grasping the fragments, and by proper manipulation perfect apposition can be readily obtained. Until a new method was adopted in treating fractures of the body of the mandible, considerable difficulty had been experienced in maintaining apposition. Those that involve the ramus present some difficulties because of the arduousness of preventing movement. Fractures of the

body of the mandible are immobilized by the use of a Kirschner wire or a small Steinman pin.

The wire selected should be small and of sufficient length to protrude over the lower lip. If a Kirschner wire or a Steinman pin is not available, a bicycle spoke cut approximately four or five inches in length and sharpened to a point will be satisfactory, as it is the correct size and it will not break. The site selected is just posterior to the canine tooth. There is approximately one-eighth of an inch of a plate of bone above the canine tooth that is sufficient for inserting the pin.

Before introducing the pin, it is advisable to reduce the fragments and hold them in position by placing a loop of strong suture material around the two lower canine teeth, pulling the suture tight and tying it. This will hold the fragments securely while the pin is being inserted. Following this the gum should be nicked on the labial surface and, with a sterile wire or pin placed in a hand drill, drill the pin through the body of the mandible and out of the opposite side through the gum. The wire should be propelled sufficiently to allow it to protrude over the lower lip for at least one inch (fig. 3). This will hold the fragments in apposition. The hand drill and the temporary suture around the canine teeth are removed and, if the pin is too long, it can be readily cut off by means of nippers. Wounds of the gums may be treated with some nonirritating, antiseptic solution. It is advisable to suture extensive lacerations. Occasionally the injury has been so great that the tissues beneath the tongue have been lacerated. If this condition exists, it may be necessary to establish drainage on the ventral side.

When the roots of the teeth are exposed as a result of the fracture, removal of the affected tooth is imperative. The pin is left in place for three weeks and then removed. During the time the pin is in position and for a period following the removal of the pin, the dog should be kept on a soft-food diet to assure complete healing. This method of treatment is highly satisfactory, since the dog has no desire to disturb the pin.

Fractures of the ramus or the rami are more difficult to handle than those of the body. When they are compound, the gum is sutured with iron-dyed linen and a cast is applied of either sodium silicate, plaster of Paris, or preferably dental plaster held in place with adhesive tape. Fractures involving the ramus and the symphysis are treated simultaneously by the use of the Kirschner wire or the Steinman pin and by applying a cast. During the period of healing with this type of a cast, it is necessary to place the dog on a liquid diet.

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Hydrochloric Acid in the Treatment of Fractures*

In eight cases of fractured bones with delayed calcification and pronounced osseous atrophy, Cornell and his coworkers observed that a diminished gastric acidity existed. Five of the patients were given 4 to 8 cc. of a 10 per cent solution of hydrochloric acid three times a day and a diet high in calcium and vitamins. The treatment increased the absorption of calcium and hastened calcification.

B.C.G. vaccination against human tuberculosis was first employed in 1921. Although employed quite extensively in France and Poland, its use has yet to be widely approved.

*The Use of Hydrochloric Acid in Certain Cases of Atrophy and Delayed Calcification of Fractured Bones. N. W. Cornell, Alice R. Bernheim, and E. C. Person. Jour. Joint & Bone Surg., xxi (Jan. 1939), pp. 1-268.

Tests for Drugs in Thoroughbreds*

By J. G. CATLETT, D. V. M.

Supervising Veterinarian, New York and Florida State Racing Commissions

THE saliva test for the detection of drugs in a thoroughbred was introduced for the first time in America in Florida, in the fall of 1932. There is little or no question in the minds of racing men that the drugging of race horses has been reduced to a small degree compared to what was formerly a vicious evil. The saliva test has done a good job.

Fig. 1. J. G. Catlett (left), supervising veterinarian for the New York and Florida state racing commissions, taking saliva test on a thoroughbred, at Belmont Park, Long Island, N. Y., Mr. Walter Turnier assisting.

There was a time when the "hopping" of horses was a common practice. In fact the practice became so widespread that the Narcotics Bureau of the United States was forced to take a hand in "cracking down" on the traffic in drugs.

State racing commissions and racing associations were agreed that something had to be done, and quickly. Rules and regulations of drastic nature were put into force throughout the country. Punishment was made severe. Fear of detection, because of the saliva test, soon had the so-called "drug-store trainer" dashing for cover.

The saliva test proved an important factor in eliminating most of the vicious-drugging practices. The sport benefited and prospered as a result. Horses became physically better because their systems were free of "dope."

But still there were unscrupulous persons who wanted to "beat the game." They had hoped to obtain stimulants or depressants which would not show in the saliva-test analysis.

We guarded against this in New York and Florida through unceasing experiments and careful laboratory analyses conducted by Charles Morgan, chief chemist for the New York State Racing Commission, and Dr. Vincent Stewart, of the Florida commission.

We are in no sense, however, ready to claim that stimulating or retarding a thoroughbred in a race has been entirely eliminated. We will always have "smart boys" who are only too willing to take a chance by employing professional advice in the attempt to find some drug that is not detectable in the saliva and yet will stimulate or retard the animal, as the purpose may be. To cope with these "smart boys," however, a further step was taken.

During the 1937-38 winter racing season in Florida, we decided to test for drugs in the urine of greyhounds. Our efforts were rewarded. When thoroughbred racing resumed in New York, a year ago, the matter was broached to Chairman Herbert Bayard Swope and the members of the New York State Racing Commission. Funds were furnished by the Commission to continue experiments on horses. A great deal of research work was carried on at the various New York courses under all track conditions, with horses in training obtained especially for this work. Numerous drugs were administered, and horses were worked, clocked and observed.

The results brought out the fact that the urine test is a most valuable adjunct to the saliva test.

*Presented before the National Association of State Racing Commissioners, Miami, Fla., January 11, 1939.

Following exhaustive experiments, these important conclusions were reached:

In every instance after the oral administration of "dope," the drug was recovered in the saliva analysis and, in some cases, after hypodermic administration.

The urine test, however, proved of value in practically every instance, regardless of the method of administration or the minute dosage used. Our chemists recovered the drug in the urine when a dosage as small as one-tenth of a grain was administered, both subcutaneously and intravenously.

We have found that, while collecting the urine for analysis is not quite as easily accomplished as the saliva specimen, it really is not difficult when proper methods are used.

As a rule, all horses will pass urine within a few minutes to an hour after cooling out. Immediately after the race, an inspector assigned to this particular task is sent to the stable with any horse chosen by the stewards for testing. The inspector remains with the horse at all times until the specimen is collected. The horse is cooled out in the usual way. When the horse is placed in the stall by the attendant, a special harness with an aluminum cup attached is strapped under the animal. The sample usually is obtained without trouble or loss of time. The sample from the mare is collected in a similar way. In no instance is catheterization resorted to, or any other means of forcing the urine.

The custom in New York and Florida is to take at least one or more urine tests daily. With these sensitive and accurate tests at our disposal, we are confident that no drug can pass the laboratory analysis undetected.

Myoglobinuria of the Horse

For the past 20 years or more, a fatal disease of the horse, myoglobinuria, has been recognized in Germany, Austria and Southeastern France. The name is derived from the presence of myoglobin in the urine of the victim. The symptoms are characteristic. The syndrome which has no near parallel for which it might be mistaken, to wit: sudden onset, profound depression; coffee-colored urine; complete anorexia; difficult reeling movements; helpless hanging of the head; hard, voluminous swelling of the cervical muscles down to the breast; engourged mucosae; rapid pulse, temperature around 104° F., and death in three to four days.

In the three cases (unpublished) occurring in the district skirting Chicago two years ago, there was no variation in this chain of symptoms. Since that time Auger and Basset of the veterinary school of Lyon have found that the disease is a piroplasmosis transmitted by the tick *Dermacentor reticulatus*. Since the Chicago cases were not examined for ticks or blood parasites, the diagnosis was clinical. But, because these horses had the run-of-woods pastures, where ticks of this genus are common, and no other cause can be imagined, it seems logical to suspect that the myoglobinuria of Continental Europe occurs in this country.

Amphetamine Sulfate in Equine Encephalomyelitis

By GEO. A. HAWTHORNE, D. V. M.
Clarinda, Iowa

CLINICAL reports in the *Proceedings of the Staff Meetings of the Mayo Clinic*, February 17, 1937, suggested the effectiveness of amphetamine sulfate in the treatment of equine encephalomyelitis. It was postulated that through administration of the drug muscular weakness would be decreased and paretic decubitus overcome. In one case an equine patient, unable to rise even with the assistance of three men, rose to her feet without help 15 minutes after hypodermic administration of 125 mg. of amphetamine sulfate. A similar dose on the next day produced a correspondingly effective result. On the ensuing two days, the dosage was increased to 200 mg. At the end of 1¼ hours on the one day and 1½ hours on the other, the animal was again able to get up and stand without aid. Also, the unilateral paresis was less marked.

The writer now uses amphetamine sulfate with satisfactory results. The in-

itial dose is 100 mg., followed by 25-mg. doses at three-hour intervals. Generally, incoördination is reduced; "backers" are aided to stand normally; the leaning tendency is overcome; sleepy symptoms are reduced; the bowel stasis and constipation are less pronounced; and the general appearance of the patient is improved. Marked improvement occurs within 15 minutes after injection of the drug.

Besides the rapid death in peracute cases, which are uniformly fatal regardless of treatment, clinical observation indicates that death in cases of equine encephalomyelitis is brought about in three ways, namely: Incoördination followed by paretic decubitus, excitement, delirium and extreme struggling, with resultant exhaustion; intoxication caused by bowel stasis and urinary retention; and starvation, resulting from persistent tongue and throat paralysis.

Death from the first and second types is frequently averted and recovery secured through the use of amphetamine sulfate with strychnine sulfate. Rational catheterization and purgation, as well as administration of quantities of water, should supplement treatment with the drug, although the former are needed less frequently.

To the writer's knowledge, the use of this drug in the treatment of equine encephalomyelitis originated in his practice. The dosage indicated is only preliminary, and some adjustment may be necessary. No harmful effects have been apparent. It is suggested that interested practitioners test amphetamine sulfate in at least one case. "Downers" which have not been allowed to remain down for too long are enabled to rise to their feet within a few minutes. The cost of the drug is not exorbitant. At the time of writing, no large animal dosage preparations are available.

Comment: There has been some confusion in regard to the proper nomenclature of the drug mentioned above. In the author's script, and in the *Proceedings of the Staff Meetings of the Mayo Clinic*, to which he makes reference, the drug was called "benzedrine sulfate." There is, however, a chemical compound, produced by a commercial laboratory, for which "Benzedrine" is the proprietary name. To clear up any confusion which might arise in reference to the compound, the council on pharmacy and chemistry of the American Medical Association last summer adopted "amethylphenathylamine" as the descriptive chemical name for the substance and "amphetamine" as its shortened nonproprietary synonym. The latter term has therefore been substituted for "benzedrine" in the vocabulary of this article.

Necrosis of the Tail in Baby Pigs

By JOHN B. BRYANT, D. V S.

Mount Vernon, Iowa

DURING the April dinner meeting of the East Central Iowa association, widespread reports were discussed of an ailment of baby pigs characterized by loss of the tail. The incidence of the condition is marked by a necrotic lesion, usually near the root of the tail and about the size of a matchhead which scabs over. From this center the lesion tends to encircle the tail, apparently destroying the circulation or so impairing it that the tail undergoes necrosis and drops off. The stump granulates and heals without marked inconvenience to the animal.

Various theories of the etiology have been advanced. Among these are nonspecific infection, baby-pig anemia, infected bites of rodents, ergotism and swine erysipelas. The writer, however, believes this to be necrotic dermatitis. Similar lesions are observed on the face of baby pigs. In these cases the pigs inflict facial abrasions on their litter mates with the "black teeth," while contending for teats. Such abrasions become infected, in the writer's opinion, with *Actinomyces necrophorus*. This organism invades the tissues deeply (observed by exploring necrotic ulcers) and destroys the nutrition. These areas die, their surfaces become somewhat leathery and, in their deeper relations, they are favorable grounds for the propagation of bacteria.

As liquefaction progresses between the living and dead parts, the latter loosen, first at the edges and then inward to the center, and finally drop off. The denuded

(*Continued on next page*)

Chronic Myeloid Leukemia of a Hog?

By ROBERT F. LANGHAM and E. T. HALLMAN, D. V. M.

Department of Animal Pathology, Michigan State College, East Lansing, Mich.

THE SPLEEN reported here was from a 210-pound hog slaughtered for market by a farmer. The farmer stated that the pig was apparently healthy but, in dressing the carcass, he found a greatly enlarged spleen. It (the spleen) was taken to a lay inspector of a sausage manufacturer who forwarded it to the department of animal pathology at Michigan State College on the eighth day following slaughter. The organ was in a fair state of preservation in spite of the time elapsing between slaughter and examination, it having been kept at a moderately cool temperature.

GROSS STRUCTURE

The spleen (fig. 1) measured 71 cm. in length and 16 cm. at the widest point, and weighed 2 kg.

The surface of the organ presented somewhat the appearance of a moderately extensive cirrhosis of the liver, the contour being uneven. There were slightly elevated, lobule-like structures, varying from 2 to 5 mm. in diameter, between which were interlacing, slightly depressed, narrow streaks of a lighter color.

Fig. 1. Spleen on eighth day following slaughter, reduced to approximately one-seventh. A twelve-inch rule is included for comparison.

On gross section, numerous small, yellowish-gray, nodule-like areas, 1 to 5 mm., were seen generally throughout the structure of the organ. They gave the appearance of malpighian bodies but some of them were considerably larger than these. The consistency of the organ was firmer than normal.

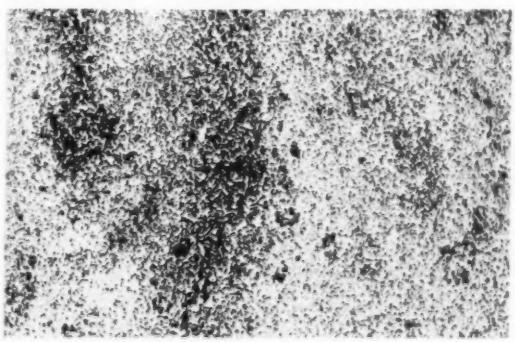

Fig. 2. Photomicrograph, including areas of malpighian bodies and red pulp (x 80).

MICROSCOPICAL STRUCTURE

Microscopical sections revealed a great loss of lymphoid tissue and the resumption of the organ's function as a blood-forming organ. Both in the red pulp and the malpighian bodies (fig. 2), the lymphoid cells were largely replaced by immature myeloid cells and collagenous fibers. The most conspicuous cells were promyelocytes and mye-

(*Continued from page* 652)

area is carpeted with granulations and heals, provided the subject survives.

In the case of the tail, the process makes short work of that structure. Sloughing of the tail is the result. In the writer's hands, necrotic dermatitis has been treated successfully with oil-can applications of antiseptic wound oil. The tail is immersed in a bottle of the oil with a mouth sufficienly wide to admit it up to and above the affected area. At this writing, the treatment has just been administered to a litter of seven purebred pigs. The condition of two of the animals was advanced beyond control, but the other five, all of which showed early lesions, recovered completely.

locytes, although there were some lymphocytes, hemocytoblasts and normoblasts. In a large number of instances the follicles had been replaced in part by collagenous fibers and in some cases, in their entirety.

The red pulp showed the sinusoids to be greatly distended with blood and in some cases it was difficult to discern their outline. The red pulp showed large numbers of myeloid cells. The neutrophilic and the eosinophilic myelocytes dominated the picture closely followed by the promyelocytes (fig. 3). A few megakaryocytes and hemocytoblasts were observed. There were large areas in the red pulp in which the lymphoid

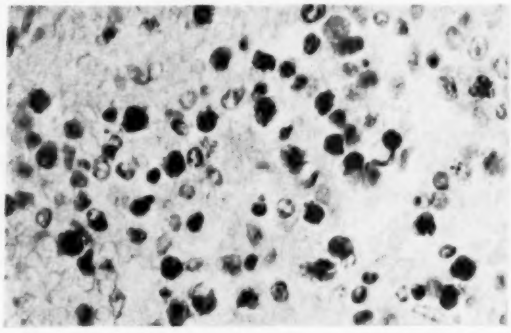

Fig. 3. Photomicrograph of red pulp, illustrating immature forms of leukocytes (x 600).

tissues had been replaced by fibroblasts and collagenous fibers. The blood contained in vessels showed the characteristics of myeloid leukemia.

Since the occurrence of myeloid leukemia in domestic animals is rare, it is felt that this report will prove of considerable interest.

Swine Erysipelas

Much of the loss from swine erysipelas can be prevented by early diagnoses and prompt use of antiserum. . . . . Farmers should be advised against harboring chronic cases, as these are spreaders of the causal organism. . . . Arthritis in pigs is generally swine erysipelas, not rickets, as some are apt to believe.—*J. A. Jensen, before the Iowa Veterinary Medical Association.*

Shipping Fever of Cattle Complicated with Pneumonia

By T. J. STEARNS, D. V. M.
Louisville, Ky.

IN SHIPPING fever of cattle with complications of pneumonia the mortality runs very high, especially during the winter months. A great number of stock cattle shipped from the western states develop the disease in transit or immediately after reaching their destination.

Prevention bacterins should be given, if possible, before the cattle are shipped. Proper care and hygiene during transportation are essential preventive measures, as well as disinfection of railroad cars and trucks, stock yards and auction-sale barns. Good results have been obtained with bacterin therapy in preventing and treating both the intestinal and pulmonary forms of the disease—granted that complications of bronchopneumonia do not develop. The pneumonia mixed bacterins are preferred; specifically, those of the bovine strain and not the "shot gun" bacterins that are offered for the treatment of all species of animals. After an animal has developed bronchopneumonia following the disease, however, neither bacterin therapy nor any other type of treatment has proved successful. A great number of such animals have been slaughtered and, on postmortem examination, have been condemned for pneumonia.

The writer has secured gratifying results through treatment of these pneumonic cases following shipping fever disease with Neoprontosil 5 per cent solution, a form of sulfanilamide. The following is a representative case.

Subject: A 400-pound short-horned steer, shipped from Texas to the Bourbon stock yards. The animal became ill on the second day after arrival.

Treatment: On the third day, a bacterin was given; temperature was 108° F. The following day the steer was decumbent and exhibited labored breathing; pneumonia developed. Neoprontosil was administered

(*Continued on next page*)

Intestinal Complications Due to Enlarged Liver

By S. E. HERSHEY, V. S., D. V. M.
Charleston, W. Va.

THE SUBJECT was a seven-year-old, pure-bred Guernsey bull; weight, 1,750 pounds.

At the time I was called, the animal had been purging for two or three days, having been given a pound of Epsom salt. My diagnosis was intestinal disorder, due to some type of liver trouble. The lower part of the rumen was badly impacted; the region of the liver was characterized by a slight tenderness and the mucous membrane of the eye was icteric. For ten days previous, the bull had been feeding on clippings of leaves of alfalfa hay. This apparently was the cause of the impaction. The temperature was 103° F.; pulse, 62; respiration, 21.

Intestinal antiseptics and stimulants were administered. During the next two days, some improvement was evident. The bull nibbled a little hay, the temperature was normal and the bowels were in better order. A physician advanced the belief that the animal was suffering from pneumonia. However, I could not detect any abnormal respiratory sounds.

The day following there was pronounced improvement but on the next morning the animal became very restless and uneasy and died within a short time.

On autopsy, no enteritis was present but there was a complete adhesion between the diaphragm and the liver. The walls of the gall bladder were thick and the bladder

Fig. 1. Liver of the affected bull.

itself was almost twice the normal size. The liver (fig. 1) weighed 58 pounds and measured 38 inches in length, 22 inches in width and 8 inches in depth. The spleen (fig. 2) was 22 inches long, 8 inches wide and 4 inches thick. From the enlargement

Fig. 2. Spleen of the affected animal.

of the spleen, one might logically have suspected anthrax.

The diagnosis made at this time was that the enlargement was due to a malignant tumor, a specimen of which was sent to Washington, D. C., and also to the laboratory at Morgantown, W. Va. In the replies we received, the specimen was de-

(Continued on next page)

(Continued from page 654)

intravenously and intramuscularly. The temperature fell to 104° on the fifth day; 60 cc. of the drug was given. Sixty-five cc. was administered on the sixth day; temperature, 103°.

The seventh day the subject began to take food and the temperature returned to normal. Twenty-four hours later the animal was returned to the sale pen, apparently having made a complete recovery. In the treatment of this particular type of bovine pneumonia following shipping disease, the drug seems to possess considerable possibilities.

Acute Endocarditis in a Cow

By CHARLES G. GREY, D. V. M.

Pathological Division, Bureau of Animal Industry
U. S. Department of Agriculture, Washington, D. C.

ACUTE endocarditis is nearly always caused by bacteria of some kind and usually is secondary to bacterial invasion elsewhere in the body. In cattle it may be observed in septicemic conditions, pneumonia, and tuberculosis. Usually the valves of the left side of the heart are affected and vegetation is present on the sides of the valves which face the blood stream.

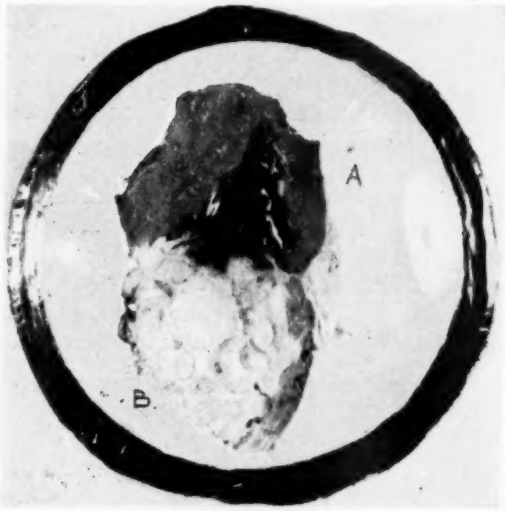

Fig. 1. A — Portion of right ventricle containing blood clot. B — Small portion of growth which almost completely filled the right auricle.

On February 8, 1939, Dr. C. Jabel Robinson of Washington, D. C., brought into this laboratory the heart, liver, spleen, kidneys, and uterus from a cow that had died three days previously. The subject was a Holstein cow, four years of age, and presented the following history: She had been pregnant since September 6, 1938. On January 28, 1939, she aborted a mummified fetus that appeared to have been dead for about two weeks. The animal at that time was in very poor condition and become progressively worse. On February 4 at 11 a. m. her temperature was 105.4° F. and at 4 p. m. it was 106°. There was manifested a marked dyspnea. Death occurred at 9:30 a. m. on February 5.

Gross examination revealed erosions of the uterine mucosa, small hemorrhages on the epicardium, and numerous small hemorrhages covering the surfaces of the kidneys and spleen. Within the right heart there was also a large vegetative growth on the tricuspid valves, suggestive of those lesions seen in chronic cases of swine erysipelas. The growth, firm in consistency and covered with a thin capsule, almost completely filled the right auricle (fig. 1), nearly occluding the atrioventricular orifice, and conformed in shape to the auricular cavity. On incision the cut surface had a mottled appearance, caused by an intermingling of fibrous tissue and walled-off areas of grayish, necrotic material. The aorta was extremely dilated.

The blood serum failed to react with either Brucella or swine-erysipelas plate antigens.

Histological examination revealed that the lesions of the heart valves consisted of organized exudate, composed largely of fibrinous and necrotic material with small cavities here and there containing coagulated blood and pus.

The kidneys showed a marked and extensive nephritis. There were numerous small hemorrhages and much blood was seen in the tubules and also in Bowman's capsules. There was a marked destruction of tubular epithelium. Many tubules were

(*Continued from page* 655)

scribed as malignant lymphoid tissue. There has been no specific name applied to this condition, the writer was told.

It is very probable that the animal had been kept under heavy feeding since a calf, and no particular symptom of the above-described condition could be recognized.

filled with albuminous material and a number of hyalin casts were noted. There was some round-cell infiltration and limited fibrous proliferation in some areas.

Congestion with parenchymatous degeneration and fatty changes in the hepatic cells were present in the liver.

Other than a slight congestion little change was noted in the spleen.

Sections from the uterus indicated that there had been rather extensive sloughing of the mucosa. There was some congestion of the vessels and a number of the larger arteries and veins contained coagulated material. There had been considerable cellular infiltration, consisting of lymphoid cells and leukocytes, the latter including polymorphonuclears and eosinophiles. There was more or less proliferation of the interstitial tissue. The submucosa showed evidence of edema. In fact, the entire muscular wall had a hydropic and degenerated appearance.

Bacteriologically, *Streptococcus subacidus* (Holman) was isolated from all of the above tissues. This organism was nonpathogenic for laboratory animals on primary isolation.

From the foregoing it is believed that here is a case in which acute endocarditis developed as a result of a general streptococcic septicemia having its origin in a septic metritis.

As already mentioned, usually the valves of the left side of the heart are affected. It is of interest to note, therefore, that the right side of the heart was involved in this instance. Such cases are apparently rare in older animals, although several cases of fetal endocarditis have been reported in which the tricuspid valve was involved.

If the blood-cell count is low, if there is impaired renal function, if sulfur has been given previously, if jaundice is present, or if there is any degree of anemia, sufanilamide is contra-indicated.

When puzzled over a difficult case do not hesitate to consult a colleague.

The Mystery of Eczema

Eczema is a baffling affliction, noted for its many manifestations and etiologic theories. It concerns an important organ —the skin—which is exposed to an endless file of hostile agencies attacking from without and within in ways often difficult to understand, and seldom easy to identify.

A theory expounded by Bonjour and Rachewsky (*Jour. de Path. Comp.*, May, 1937) is that eczema is intimately related to vasomotor tension exerted not only upon the skin but also upon the glandular system. All psychic and chemophysical action can cause eczema, provided the cardiovascular or vasomotor centers are faulty. The treatment, therefore, would consist of restoring vasomotor equilibrium by searching for and correcting the cause of the upset which, these authors declare, may last for several years, or slowly disappear spontaneously.

This theory is well supported by the observations of Campbell, distinguished small animal practitioner of Toronto, who states that eczema is rare in well groomed dogs, that is to say, dogs whose cutaneous, vasomotor mechanism is capable of warding the skin against injury from within or without.

Blood Transfusion in Purpura Hemorrhagica

The generalized toxi-infectious blood disease we know as purpura hemorrhagica yields to homologous transfusion, according to an abstract published in Revue de Médecine Vétérinaire (March, 1938). Of this procedure, the author says:

> Blood transfusion acts at once by the volume it brings to the insufficient circulatory mass, and introduces blood cells and plasma which act as antiseptics, restoratives and stimulants to the body. The proof is the drop in temperature and restoration of all of the functions, together with progressive augmentation of the blood's coagulability.

Citrated or whole blood may be employed, although the latter is preferable where the difficulties of whole-blood transfusion are not obstacles to carrying out the procedure.

Practical Urine Analysis*

EXAMINATION of urine for pathological constituents requires no expensive apparatus, nor any special skill in conducting the analysis. The few tests that are necessary for a routine analysis should not require more than 20 to 30 minutes and may even be completed in less time after some practice. In certain instances, it may be necessary to use but a single test; *e.g.*, a test for ketone bodies in suspected cases of ketosis in cows (acetonemia) and ewes (pregnancy disease).

It is important to remember that the results of the examination must always be correlated with the history and clinical symptoms of each case.

Fresh-voided urine should be used whenever possible. If this is not convenient, the specimen should be kept in the refrigerator. A small amount of toluene added to the sample acts as a suitable preservative. For best results, it is desirable that the analysis be made on filtered urine. (Either filtered or unfiltered urine may be used for the ketone test.)

The following tests have been found satisfactory and adequate for a routine analysis of urine specimens submitted to the laboratory of animal pathology and hygiene, University of Illinois.

LITMUS PAPER TEST FOR REACTION

Materials: Red and blue litmus paper.

Procedure: Dip one end of the paper into the urine and note whether there is any change in color. The paper selected will usually depend upon the species of animal from which the urine was collected; *viz.*, blue for the dog, cat, and pig; red for the horse, cow and sheep. Alkaline urine turns red litmus blue; acid urine turns blue litmus red.

Remarks: If the urine is not fresh, little or no significance can be attached to the result. Even when the urine is fresh, it is questionable whether this test has any real value.

Some Interpretations: Acid urine from a pregnant or lactating cow may be suggestive of acetonemia. Acid urine from a pregnant ewe may be suggestive of pregnancy disease. Alkaline urine from a dog may be suggestive of cystitis.

FISH'S PICRO-ACETO-GLYCEROL TEST FOR ALBUMIN

Reagent: Picric acid—10 gm; glacial acetic acid —10 cc.; glycerol —250 cc.; water — to 1,000 cc. Dissolve the picric acid in hot water and add the other ingredients. (Distilled water should be used in preparing reagents.)

Procedure: Introduce about 5 cc. of the reagent into a test tube. Hold the tube in the left hand at an angle of 45° and then add gently, by means of a medicine dropper, the end of which is held against the side of the tube, approximately 5 cc. of clear urine. Carefully return the tube to a perpendicular position and observe whether a yellowish-white ring appears at the zone of contact between the reagent and the urine. The thickness of the ring is a rough measure of the quantity of albumin present in the specimen.

Remarks: This is a sensitive test for albumin. It has been found applicable for any of our common species of animals. The test for albumin is extremely useful but the significance of a positive result must not be arrived at too hastily. Whenever possible, a positive reaction should be followed by a microscopical examination of the sediment in the urine. The sediment may be obtained by allowing a portion of the urine to stand for several hours and then pouring off the top urine, or more expeditiously by centrifuging 10 to 15 cc. of the well mixed sample. The microscopical examination may reveal the presence of casts. The casts come from the tubules of the kidney and these, together with a positive test for albumin, are indicative of nephritis. A positive test for albumin, whether or not accompanied by a micro-

*From the division of animal pathology and hygiene, department of animal husbandry, College of Agriculture, University of Illinois.

scopic examination, should not be considered without some possible significance. Tests on separate specimens of urine over a period of days or weeks will invariably show whether the albuminuria is mild and transitory or decidedly pathological and permanent in nature. If of the latter type, it is usually safe to assume that the kidneys, as well as other parts of the urogenital system, are involved.

Some Interpretations: Albuminuria in the cow may suggest pyelonephritis or cystitis. In the ram, albuminuria may suggest cystitis and inflammation of the urethra due to calculi. Positive tests may suggest nephritis and inflammation of other parts of the urogenital system in dogs.

BENEDICTS' TEST FOR SUGAR

Reagent: Copper sulfate—17.3 gm.; sodium citrate—173 gm.; sodium carbonate (C. P. Anhydrous)—100 gm.; water—to 1,000 cc. Dissolve the copper sulfate in 100 cc. of hot water, cool, and dilute to about 150 cc. Dissolve the 173 gm. of sodium citrate and 100 gm. of sodium carbonate in 600 cc. of water with the aid of heat. Cool and dilute to approximately 850 cc. When the solutions are cool, add the copper sulfate to the combined sodium citrate-sodium carbonate solution. Stir continually while making the addition and do not add the copper sulfate solution rapidly. Make up to one liter.

Procedure: Introduce 5 cc. of the reagent into a test tube and heat to the boiling point. The solution should remain a clear blue color. Now add eight to ten drops of the urine and boil vigorously for two minutes over a free flame or from two to three minutes in boiling water. A piece of paper folded into a narrow band serves as a satisfactory test tube holder. The test may be considered positive if a green or orange-colored precipitate forms in the solution. A slight turbidity has little significance.

Remarks: Benedicts' reagent is stable and a positive result is seldom misleading, unless the test is conducted on urine that has been voided during the latter stages of pregnancy and the early part of lactation. A positive test during these periods may be due to lactose. Confirmatory tests for glucose may be used but are not often necessary. Furthermore, the significance of a positive test must be determined by an examination of several specimens.

Some Interpretations: At the present time, the usefulness of the test for sugar seems to be restricted to the detection of diabetes in dogs. A heavy precipitate should suggest the possibility of this disease. A positive test for sugar coupled with a highly positive test for ketone bodies is strong evidence that the animal is affected with diabetes. So-called feedlot hyperglycemia in lambs is characterized by a tremendous increase in the blood sugar and the elimination of large quantities of sugar in the urine. This disease is usually fatal. Lambs and mature sheep may die from what appears to be an acute form of indigestion due to over-feeding on concentrates, especially shelled corn, without the elimination of sugar in the urine.

HAY'S TEST FOR BILE SALTS

Reagent: Finely powdered sulfur (flowers of sulfur).

Procedure: The sulfur is sprinkled on the surface of a small quantity of urine. If the specimen contains pathological amounts of the bile salts, the sulfur sinks rapidly to the bottom. The sulfur remains on the surface of normal urine.

Application: Pathological amounts of bile salts in the urine may be expected to be associated with disorders that are characterized by jaundice.

WEBER BENZIDINE TEST FOR HEMOGLOBIN

Reagent: Ether, glacial acetic acid, saturated alcoholic solution of benzidine, 3 per cent hydrogen peroxide. (Caution: Ether and alcohol must be kept away from fire.)

Procedure: Add 1 cc. of glacial acetic acid and 10 cc. of ether to 10 cc. of urine. Shake well for several minutes and set aside. The ether extracts the pigment, hematin, from the hemoglobin and rises to the top. Pour off the layer of ether and to this add 2 cc. of the benzidine solution

followed by 2 cc. of the 3 per cent hydrogen peroxide. If the urine contains hemoglobin, a greenish-blue color develops after the addition of the hydrogen peroxide.

Remarks: Occasionally red blood cells without free hemoglobin are present in the urine. The red cells are readily detected by the microscopical examination.

Some Interpretations: Hemoglobinuria in the dog may suggest calculi, cystitis, possibly nephritis or prostatitis. A positive test in the cow strongly suggests pyelonephritis, and in the ram, calculi. Since bloody urine may be the result of trauma or some less serious cause, it is often advisable to attempt to determine if the source of the blood is below the kidney. The use of the microscope in a careful study of the sediment is indicated.

ROSS' MODIFICATION OF ROTHERA'S NITROPRUSSIDE TEST FOR KETONE BODIES

Reagent: (1) Sodium nitroprusside—1 gm.; ammonium sulfate — 100 gm. (2) Ammonium hydroxide. Grind the sodium nitroprusside to a fine powder and mix with powdered ammonium sulfate. Store in a brown bottle.

Procedure: (It is not essential to use filtered urine for this test.) Put approximately 1 gm. of the sodium nitroprusside-ammonium sulfate mixture into a test tube. Add about 5 cc. of urine and shake until the solid mixture goes into solution. Now add 2 cc. of the ammonium hydroxide. A positive test is indicated by a deep purple color. The color is not permanent (ten to 20 minutes).

Remarks: This is a very sensitive test for even small quantities of aceto-acetic acid, one of three chemical substances known as the ketone bodies. Acetone, another member of the group, will also react to the test.

The ketone bodies are a closely related group of chemical substances that may be considered as intermediate products of fat metabolism. The ketone bodies are formed chiefly in the liver. These substances are toxic. Furthermore, two of the ketone bodies are acids and, therefore, rob the body of alkali. This may result in intense acidosis (lowered alkalinity).

Some Interpretations: Normal dog urine invariably gives a negative test for ketone bodies. A strong positive reaction, if accompanied by a positive test for sugar, is suggestive of diabetes. The result of this test may be considered almost pathognomonic of acetonemia and of pregnancy disease. A diagnosis of clinical and subclinical acetonemia in cows and pregnancy disease in ewes can be made quickly and accurately by this test. A slight positive reaction may or may not be significant.

Methylene Blue in Eczema*

Intravenous injections of methylene blue are recommended for the treatment of eczema. The dose for dogs is 5 cc. of a 2 per cent solution, repeated every two to three days. Seven to eight injections are usually sufficient. After the third or fourth injection the pruritus ceases and the plaques dry up.

*Rousell and Nouyen van Ba, Essai de Traitement de l'Eczéma du Chien par le Bleu de Méthylene. Rév. de Path. Comp., xxxvii (Sept., 1937), p. 551.

F. R. Beaudette of the New Jersey Agricultural Experiment Station, New Brunswick, N. J., writes:

> In the May, 1938, issue I reported on "An Outbreak of Fowl Typhoid in Guineas," and unfortunately, overlooked the report by Johnson and Anderson on "An Outbreak of Fowl Typhoid in Guinea Fowls (*Numida Meleagris*)," Jour. A. V. M. A., lxxxii (1933), n. s. 35 (2), pp. 258-259. Therefore, my statement that "A review of the literature fails to reveal a similar outbreak in this species," is not correct. The rather extensive references concerning susceptible species should be evidence that no oversight was intended.

To reprints of the article, "Some Tests with Crystal-Violet Vaccine for Prevention of Hog Cholera," by B. H. Edgington and A. F. Schalk, published in the May, 1939, issue, pages 501-509, a table showing tests of minor vaccines has been added. Anyone wishing to secure one of these reprints should write to Dr. B. H. Edgington, c/o Animal Disease Laboratories, Ohio Agricultural Experiment Station, Reynoldsburg, Ohio.

Vitamin E and Nutritional Muscular Dystrophy

GOETTSCH and Pappenheimer[1] described a dietary deficiency disease in rabbits and guinea pigs characterized by dystrophy of the voluntary muscles. Morgulis and Spencer[2] and Morgulis, Wilder and Eppenstein[3] found that at least two factors, both contained in whole wheat germ, were required for the prevention or cure of the disease. One factor was found to be present in the oil and was thought to be vitamin E.

Mackenzie and McCollum[4] confirmed the work of Goettsch and Pappenheimer by noting that young rabbits with a restricted vitamin E diet developed muscular dystrophy and died. They obtained similar results when 10 per cent of ether-extracted wheat germ was included in the diet. Morgulis[5] observed increased excretion of creatine by rabbits with impending dystrophy. The excretion of creatine measured against weight, and food consumption of the animal day by day, furnished Mackenzie and McCollum reliable criteria, enabling them to predict with considerable certainty when the attack of acute dystrophy would occur.

Using the creatine measure as a basis for diagnosis, Mackenzie and McCollum produced cures in rabbits with wheat-germ-oil sources of vitamin E, and were led to the thought that vitamin E could be the curative factor. They next fed natural alpha-tocopherol and promptly obtained a sharp drop in urinary creatine accompanied by increased food consumption and gain in weight. Within a few days the animals were able to move about the cages without difficulty and the creatine output had fallen to the normal level.

Mackenzie and McCollum considered, therefore, that they had shown conclusively that one of the deficiencies involved in causing experimental muscular dystrophy in the rabbit is vitamin E.

Butler and Warren[6] have reported in the JOURNAL a correction of certain forms of muscular dystrophy in fowl which could have been present in the large number of field cases of so-called range paralysis. The evidence is now seemingly complete that muscle metabolism is severely impaired in cases of vitamin E deficiency; and this corroborates the announcement by Evans and Burr[7] for the rat and by Adamstone for fowl that in the developing animal and bird, vitamin E is necessary selectively for the protection of the tissues derived from the mesoderm. Voluntary muscles are all mesodermal derivatives.

This confirmation from Mackenzie and McCollum sustaining the previous observations of others, that vitamin E can correct certain forms of muscular impairment, is of tremendous importance to the live stock industry. The deposition of flesh on animals is purely a matter of muscle metabolism; and this mesodermal derivative seemingly responds to vitamin E fluctuation.

References

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[2]Morgulis, S., and Spencer, H. C.: Jour. Nutrition, xi (1936), p. 573.
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[5]Morgulis, S.: Nutritional Muscular Dystrophy. (Hermann I. Co., Paris, 1938.)
[6]Butler, W. J., Warren, D. M., and Hammersland, H. L.: Jour. A.V.M.A., xciii (1938), n. s. 46 (5), p. 307.
[7]Evans, H. M., and Burr, G. O.: Memoirs, Univ. Calif., viii (1927), pp. 1-176.

Daily doses of tetanus antitoxin given epidurally for tetanus in horses is advocated as the treatment of choice in a recent report from Germany. Each injection is followed by a general improvement lasting from 16 to 20 hours.

To the list of references of the article entitled, "Calfhood Vaccination Against Bang's Disease. I. Effect on Agglutinin Titres and Results of First Pregnancies," by John G. Hardenbergh, published in the May, 1939, issue, pages 479-488, the following addition should be made:

[6]Cotton, W. E., Buck, J. M., and Smith, H. E.: Efficacy and safety of abortion vaccines prepared from *Brucella abortus* strains of different degrees of virulence. Jour. Agr. Res., xlvi (1933), 4.

This addition changes reference 6, as listed, to 7, and reference 7 to 8.

Curled Tongue in Young Poults

By C. B. HUDSON

New Jersey Agricultural Experiment Station, New Brunswick, N. J.

A POULTRYMAN submitted two four-week-old poults for examination on February 6, 1939. In both, the end of the tongue was curled back, as illustrated in figure 1. The

Fig. 1. An affected poult, showing the curled-tongue abnormality.

owner stated that he had purchased hatching eggs through an out-of-state turkey growers association. From this lot of eggs 200 chicks were hatched, and in none was there indication of disease. Four weeks later he received another lot from the same source. The fertility was 90 per cent and the hatchability 65 per cent. About 200 chicks were hatched from this lot.

Just as soon as these chicks started to eat, the owner noticed that some were having difficulty in taking food and water. On examination, he found that the end of the tongue was curled back. Approximately 25 per cent of the birds were affected and 30 have died, apparently from starvation. Whether the disease is congenital or acquired cannot be stated at this time.

Trichinosis and Trichinoscopy*

In a classical thesis for the degree of doctor of veterinary medicine (Lyon), S. Vadomlianski pronounces trichinosis a rare disease of man at the present time. The disease is more common in rats, bears, foxes, mice, ferrets, dogs, cats, badgers and mullets than in swine. Horses, calves, rabbits, and guinea pigs can be experimentally infected. In swine, the disease is contracted by eating the raw flesh of these animals, especially that of rats. These raw-flesh eaters contract the disease from the flesh of one another. Prophylaxis in man and swine lies in avoiding the consumption of incompletely sterilized flesh in cooking, seasoning, smoking and refrigeration. The feeding of fish (mullets) to swine is particularly infective.

Trichinosis can now be detected in the living by the intradermal test of Bachmann. (The use of this test has disclosed the true incidence of the various degrees of trichinosis in man.—*Ed.*) The disease in man is manifested by three distinct phases, to wit: (1) The *intestinal* or choleric; (2) the *rheumatismal* or myosytic; and (3) the *cachectic*. Occasionally the verminous cysts can be seen with the unaided eye, particularly when characterized by marked pericystic reaction or calcification.

The thesis is, however, mainly consecrated to trichinoscopy, which has been studied intensively at the abattoir of Kaunas, Lithuania. The author gives interesting details on collecting, preparing and examining specimens with the trichinoscope, with which one is able to identify the parasites.

*Abstract in Revue de Médicine Vétérinaire, xc (March, 1938), p. 171.

A Summary of 700 Autopsies on Sheep and Lambs*

By L. B. SHOLL, B. S., D. V. M.

Animal Pathology Section, Michigan Agricultural Experiment Station

FREQUENTLY we are asked what are the most important causes of death in sheep and lambs. Our autopsies come mainly from points within a radius of 100 to 150 miles of our campus, but some have come from points well up in the Upper Peninsula. We believe that they represent the sheep-raising problem in Michigan fairly well.

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Acute indigestion	1
Acute tympany	7
Acute tympany and enteritis	3
Agenesia of cerebellum	1
Blindness	1
Botulism	2
Broken mouth and intoxication	2
Broken mouth and parasitism	3
Bronchopneumonia	36
Bronchopneumonia and parasitism	3
Cardiac stenosis and parasitism	1
Cerebral hemorrhage	2
Cholecystitis and hepatitis	1
Choledochitis and enteritis	1
Cirrhosis of liver	1
Coccidiosis	5
Endometritis and septicemia	1
Enteritis	3
Enteritis and acute tympany	1
Enteritis and intoxication	2
Enteritis and parasitism	1
Erosive gastritis	1
Eversion and rupture of vagina	1
Experimental	26
Faulty teeth	2
Faulty teeth and gastroenteritis	1
Faulty teeth and parasitism	1
Fracture of jaw and skull	1
Gastritis	6
Gastritis and hepatitis	1
Gastritis and parasitism	1
Gastritis and tympany	1
Gastroenteritis	40
Gastroenteritis and hepatitis	1
Gastroenteritis and pregnancy disease	1
Heatstroke	4
Hemorrhagic colitis	1
Hemorrhagic gastritis	1
Hemorrhagic gastroenteritis	2
Internal hemorrhage	1
Intoxication	164
Intoxication and nephritis	2
Intoxication and parasitism	10
Intoxication and pneumonia	3
Intussusception	4
Leukemia	1
Lymphosarcoma	1
Necrotic gastritis	2
Necrotic gastroenteritis	1
Necrotic pneumonia	8
Necrotic pneumonia and pericarditis	1
Necrotic pneumonia and peritonitis	2
Negative	5
Nephrosis and intoxication	1
No diagnosis	14
Ophthalmitis, optic neuritis and purulent meningitis	1
Parasitism	105
Parasitism and dental caries	3
Parasitism and enteritis	2
Parasitism and gastritis	1
Parasitism and gastroenteritis	1
Parasitism and intoxication	27
Parasitism, nephritis and intoxication	1
Parasitism and pneumonia	5
Parasitism and pregnancy disease	2

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Curled Tongue in Young Poults

By C. B. HUDSON

New Jersey Agricultural Experiment Station, New Brunswick, N. J.

A POULTRYMAN submitted two four-week-old poults for examination on February 6, 1939. In both, the end of the tongue was curled back, as illustrated in figure 1. The

Fig. 1. An affected poult, showing the curled-tongue abnormality.

owner stated that he had purchased hatching eggs through an out-of-state turkey growers association. From this lot of eggs 200 chicks were hatched, and in none was there indication of disease. Four weeks later he received another lot from the same source. The fertility was 90 per cent and the hatchability 65 per cent. About 200 chicks were hatched from this lot.

Just as soon as these chicks started to eat, the owner noticed that some were having difficulty in taking food and water. On examination, he found that the end of the tongue was curled back. Approximately 25 per cent of the birds were affected and 30 have died, apparently from starvation. Whether the disease is congenital or acquired cannot be stated at this time.

Trichinosis and Trichinoscopy*

In a classical thesis for the degree of doctor of veterinary medicine (Lyon), S. Vadomlianski pronounces trichinosis a rare disease of man at the present time. The disease is more common in rats, bears, foxes, mice, ferrets, dogs, cats, badgers and mullets than in swine. Horses, calves, rabbits, and guinea pigs can be experimentally infected. In swine, the disease is contracted by eating the raw flesh of these animals, especially that of rats. These raw-flesh eaters contract the disease from the flesh of one another. Prophylaxis in man and swine lies in avoiding the consumption of incompletely sterilized flesh in cooking, seasoning, smoking and refrigeration. The feeding of fish (mullets) to swine is particularly infective.

Trichinosis can now be detected in the living by the intradermal test of Bachmann. (The use of this test has disclosed the true incidence of the various degrees of trichinosis in man.—*Ed.*) The disease in man is manifested by three distinct phases, to wit: (1) The *intestinal* or choleric; (2) the *rheumatismal* or myosytic; and (3) the *cachectic*. Occasionally the verminous cysts can be seen with the unaided eye, particularly when characterized by marked pericystic reaction or calcification.

The thesis is, however, mainly consecrated to trichinoscopy, which has been studied intensively at the abattoir of Kaunas, Lithuania. The author gives interesting details on collecting, preparing and examining specimens with the trichinoscope, with which one is able to identify the parasites.

*Abstract in Revue de Médicine Vétérinaire, xc (March, 1938), p. 171.

A Summary of 700 Autopsies on Sheep and Lambs*

By L. B. SHOLL, B. S., D. V. M.

Animal Pathology Section, Michigan Agricultural Experiment Station

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Parasitism and dental caries	3
Parasitism and enteritis	2
Parasitism and gastritis	1
Parasitism and gastroenteritis	1
Parasitism and intoxication	27
Parasitism, nephritis and intoxication	1
Parasitism and pneumonia	5
Parasitism and pregnancy disease	2

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Patent foramen ovale	1
Perforative gastritis	2
Periarthritis and parasitism	1
Periproctic abscess and rupture of urinary bladder	1
Peritonitis	3
Peritonitis and hepatitis	1
Peritonitis and pleurisy	1
Pleurisy	1
Pleurisy, pericarditis, hepatitis and mastitis	1
Pleurisy, pericarditis and pneumonia	1
Pleuropneumonia	6
Pleuropneumonia and pericarditis	1
Pneumonia and arthritis	1
Pneumonia and gastroenteritis	1
Pneumonia and hepatitis	1
Pneumonia and intoxication	2
Pneumonia and parasitism	2
Pneumonia and pyelonephritis	1
Pneumonia and white muscle disease	3
Poisoning	3
Pregnancy disease	52
Pulmonary congestion	1
Pulmonary edema	1
Purulent arthritis	2
Purulent arthritis and pneumonia	1
Purulent meningitis	5
Purulent peritonitis	1
Purulent pleurisy	1
Pyosepticemia	3
Rhinitis and meningitis	1
Rhinitis and parasitism	1
Rumen impaction and intestinal obstruction	1
Rumenitis and parasitism	1
Rupture of urinary bladder	3
Salt poisoning	4
Sarcomatosis	1
Scabies and hepatitis	1
Scrotal infection and urethral rupture	1
Septicemia	5
Sinusitis	1
Spinal abscess	2
Spinal myelitis	1
Starvation	2
Stomatitis and intoxication	1
Subacute vegetative endocarditis	1
Suffocation	1
Suppurative meningitis and hemorrhage	1
Suppurative meningitis and hydrocephalus	1
Suppurative pleurisy and peritonitis	1
Suppurative pneumonia and arthritis	1
Tetanus	5
Thoracic abscess and adhesions	1
Torsion of small intestine	1
Toxemia	3
Traumatism	4
Traumatism and maggots	1
Typhlitis and hepatitis	1
Umbilical infection	1
Ulcerative laryngitis	1
Valvular vegetations and pneumonia	1
Verminous pneumonia	1
White muscle disease	7
Wild cherry poisoning	2
	700

Sulfanilamide in Actinomycosis*

A case of actinomycosis of the lower abdomen in an eleven-year-old boy was completely cured by dosing with sulfanilamide. After the thymol and potassium iodide treatment had failed to make any impression on the course of the disease, during a treatment lasting from October 29 to January 18, sulfanilamide was given in addition to the other treatment. By the end of March, the boy had made such improvement that all medication except sulfanilamide was discontinued. In August, the opening had closed and by October 1, the cure was complete. The authors' conclusion was that "the clinical cure of the actinomycosis was from the sulfanilamide."

Anemia of pregnant ewes can be attributed to copper deficiency and it yields to a supplement of copper given in the ration. Spectographic and chemical determinations show that the quantity of copper in the blood, liver and milk is much higher in healthy ewes than in ewes affected with anemia.—*Bennetts and Chapman* (*An. de Méd. Vét.*, Aug., 1938).

*Sulfanilamide Therapy in Actinomycosis. Edwin M. Miller, M. D., and Egbert H. Fell, M. D., Chicago. Jour. Amer. Med. Assn., cxii (Feb. 25, 1939), p. 731.

LEGAL OPINIONS

By JOSEPH M. KOTZ
Attorney for the Association

Unauthorized Practice

The universal custom among the states requiring a license of veterinarians (physicians and surgeons) is to vest in a medical board the power of examining applicants and determining their fitness to practice. This our courts have held to be valid. (*Ruling Case Law*, vol. 21, p. 365.)

True, such boards are ministerial in their nature, but a full discharge of their duties often necessitates the consideration of legal questions. As there is no real distinction between refusing and revoking a license, the same body which may be vested with power to grant or refuse to grant a license may also be vested with power to revoke it. To particularize, a state may delegate not only the power of determining an applicant's intellectual fitness and educational qualifications but also his moral fitness; or the power may be broad enough to cover the general fitness of the applicant. Should the board act arbitrarily, a court may intervene in order to protect private rights. However, these boards have broad discretionary powers and the exercise thereof, if not unreasonable and if free from fraud, corruption or oppression, will not be disturbed.

A statute providing for revocation of a physician's license for "gross carelessness" is not too vague. (*Y*— vs. *H*— *et al*, 52 Fed. (2d) 411).

The right or privilege to practice veterinary surgery or medicine is a vested and valuable property right which is to be protected under the constitution and the laws of the states; but the state in the exercise of its inherent police power may place such restrictions on a licensee as may be necessary for the welfare and safety of society (*H*— vs. State Medical Examiners, 134 S. E. 42).

Injunction is a proper remedy to prevent the unlicensed practice of any profession, when asked by persons engaged in such profession, acting for themselves and other affected members of their profession. The character of the special right to practice such profession is a special privilege or franchise and so a property right, being enough to justify relief by injunction (*F*— vs. *T*—, 254 N.W. 910).

In *R*— vs. *E*—, 181 Iowa, 156, the plaintiff brought action to recover for services rendered in vaccinating the defendant's hogs with hog-cholera serum. *He had publicly advertised himself as a veterinarian, was employed as a veterinarian, had diagnosed the ailment of the hogs as a veterinarian and treated the hogs as a veterinarian.* He possessed no certificate from the state board of veterinary medical examiners authorizing him to practice veterinary medicine. The lack of a certificate rendered him indictable under the statute of the state. When the services were rendered, the statutes authorized anyone to administer hog-cholera serum, providing he had taken the special course of instruction and had been granted a permit as required by law. The plaintiff, prior to rendering the services, had taken such a course of instruction and had received said permit. Had he not assumed to *act as a veterinarian*, his right to recover would have been unquestioned. Held: Recovery was not authorized even though he possessed high qualifications and had personally acted in good faith, because the court could not separate the criminal acts from the lawful acts.

It was held in the case of *L*— vs. *G*—,

125 N. Y. Supp. 35, that an *unlicensed* veterinary surgeon cannot recover for board of a horse while in his possession as a veterinarian for the purpose of treatment.

In *P*— vs. *J*—, 179 Pac. 78, it was held that the statute which required veterinary surgeons to be licensed but which also provided that such provisions did not apply to persons who gratuitously treated diseased animals, did not prevent recovery of the price of hog-cholera serum furnished and administered to hogs by the person not licensed as a veterinarian, where the charge was for the serum and no charge was made for the administration thereof.

Legal Oddities

Fishermen are prohibited under a state law of California from angling for trout while on horseback.

To distribute samples of patent medicines in Duluth, Minn., is unlawful.

A New York law forbids anyone to kill a rabbit or a bird in a cemetery.

In Los Angeles, California, it is illegal to sell lizards, snakes, or other reptiles in any public place.

Client: "The law is a queer business."
Lawyer: "How so?"
Client: "The witness takes an oath to tell the truth."
Lawyer: "Then what?"
Client: "And every time he shows signs of doing so, the lawyer objects."

Canine Heir Has Too Much to Spend

Brownie, an eleven-year-old Airedale, inherited $20,000 from his mistress, the late Mrs. Marion B. Springer of Woburn, Mass. After an administrator's accounting of the heir's expenses, it was decided that the legacy is too large, and accordingly it was cut to $5,000.

From April 28 to October 10, 1938, $190 was spent to maintain Brownie. The expenses included $6 a week for board, $36.15 for a wire-fenced play pen and $17 for veterinary services.

One Dog May Bite Another, Kentucky Court of Appeals Rules

Recently the Kentucky Court of Appeals handed down a decision that the Jefferson Circuit court (Louisville) had properly excluded evidence in a damage suit concerning a dog's disposition toward other dogs. The dog in the case was said to have bitten a plaintiff, eleven years old.

"The instant question was the dog's propensity to attack a human," the court ruled. "The canine code duello is something else. That involves rules of canine etiquette. The right of dogs to fight is one of the few privileges which they still retain in the domesticated state."

Pigs Ousted from Parlors by Village Ordinance

In Niles Center, Ill., members of the village board recently passed an ordinance forbidding residents to keep pigs in their homes.

For quite a while, village officials had been receiving complaints about ducks. Neighbors protested that the ducks quacked too loudly and that some people allowed them to sleep in the house. An investigation revealed that the pig situation was almost as acute and that one lamb was living in a Niles Center home. Therefore, the board passed an ordinance to the effect that pigs, ducks, geese, sheep, horses, cows, calves and goats must be kept out of Niles Center dwellings. The officials decided that by restricting all of these animals in the ruling, owners of pigs could not claim unjust discrimination.

The ordinance also applies to clubhouses, hotels and hospitals. Further, the owners of such establishments will not even be permitted to keep the afore-mentioned animals in the backyard. The ruling provides, however, that they may keep them in the backyard, granted that they tear down the clubhouse, hotel or hospital.

Significantly, there are no hotels or hospitals in Niles Center.

CURRENT LITERATURE

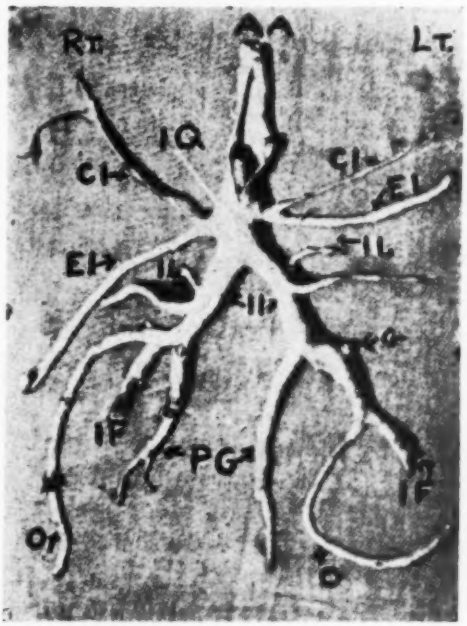
ABSTRACTS

Thrombic Obstruction of the Posterior Aorta of a Horse

THE SUBJECT was a nine-year-old mare belonging to a military organization in India. The author describes a typical case of so-called iliac thrombosis. The mare had been in his service for two years and ten months before showing any symptoms of the affliction. One morning, while being exercised, she showed an acute lameness on the off hind leg and on every day thereafter she manifested the same symptoms under exercise. After a week of observation she was mounted and exercised for 20 minutes. This amount of exertion precipitated a violent lameness with agonizing pain and distress. The affected leg was colder than the others. After a few hours of rest following each of these seizures, everything returned to normal.

Pulsation of the aorta and other branches revealed the nature of the trouble. The aorta at its quadrification was hard and noncompressible and the pulsations in the iliacs were not normally distinguishable. A diagnosis of thrombosis having been made, the subject was sent to the veterinary college at Madras for further examination and autopsy. The condition that was revealed is shown in the accompanying illustration. The dissection made in the department of anatomy brought out an excellent specimen for photographic reproduction, a specimen which we believe has seldom, if ever, been duplicated in veterinary literature. Through the careful dissection made, it was possible to portray the extensive involvement. In addition to the illustration, the author gives a complete list of the arteries involved in the obturation, as follows:

1. The abdominal aorta, for about two inches at its termination.
2. The right circumflex iliac, from its origin to its bifurcation and even its posterior branch.
3. External iliacs were normal, except at their origin from their aorta.
4. Right deep femoral artery throughout.



—*From the Indian Veterinary Journal, April, 1939.*

Photograph of the specimen of thrombosis of the abdominal aorta in a horse, showing dorsal recumbent position. (AA, abdominal aorta; IQ, iliac quadrification; CI, circumflex iliac artery; EI, external iliac artery; IL, ilio-lumbar artery; II, internal iliac artery; G, anterior gluteal artery; PG, posterior gluteal artery; O, obturator artery; IF, iliaco-femoral artery.)

5. Both of the internal iliacs—the right more completely than the left. The blocking extended further back in the left internal iliac.
6. Left ilio-lumbar arteries.
7. Left gluteals were blocked for a longer extent than the right.
8. Right obturator artery was blocked to a greater distance below the obturator foramen than the left.
9. Iliac femorals of both sides were

equally blocked. *(Abstract of "Thrombosis of the Abdominal Aorta in a Horse," by V. D. Ratnam, G.M.V.C., Indian Vet. Jour., xv (April, 1939), pp. 421-423.)*

Comment: Although iliac thrombosis of horses is not a common disease, it is nevertheless exceptionally interesting. Its spectacular manifestation and incurability, not to mention its unknown etiology, are the attracting features. Rarely in literature has this unusual disease been so well described pictorially. Anatomist Sri H. N. Chelva Iyengar, who prepared the specimen, is to be complimented for the fine results he was able to obtain. The report infers that this trouble developed between November 17 and December 6, 1938. Such rapid development is rare.

EXPERIMENTAL STUDIES ON ENDAMOEBA HISTOLYTICA IN THE DOG. John Clyde Swartzwelder. Amer. Jour. Hyg., xxix (1939), p. 89.

Experiments were conducted on 24 healthy young dogs to determine if internal autoinfection from cysts occurs. Material containing cysts only was injected into the ileum, large intestine, cecum and colon. Excystation failed to occur. It was concluded that internal autoinfection from cysts does not occur under normal conditions.

Following ingestion of cysts of *Endamœba histolytica* excystation occurred both in the ileum and the large intestine of the dog. Excystation occurred within 1.5 to 4.5 hours following ingestion. Cysts which had been refrigerated for 43 days at about 5° C. excysted when fed to a dog. Unripe cysts which were allowed almost no incubation period outside the body usually produced an infection when fed to the dog.

A study of the development of *E. histolytica in vivo* for a period of 24 hours following inoculation revealed no metacystic trophozoites which contained more than four nuclei. Tissue invasion occurred within 24 hours after ingestion of cysts, and blood and mucus containing trophozoites of *E. histolytica* were found in the contents of the large bowel 48 hours after inoculation with cysts *per os*. Five of 23 dogs became infected following ingestion of trophozoites of *E. histolytica*. In a large number of animals trophozoites passed through the stomach and small intestine in a viable condition.

FOWL LEUKOSIS. V. Transmission experiments. C. D. Lee and H. L. Wilcke. Poultry Sci., xviii (1939), p. 250.

Fowl leukosis in all of its expressions may be transmitted to healthy chicks by injection of tissue suspensions of affected organs, by injection of cell-free filtrates, by pen-contact exposure or by contact with contaminated soil and litter. The incubation period of the disease is four to eight months. The clinical course is variable. Few recoveries occur. There were definite differences in susceptibility and resistance in different birds and birds of different strains. The authors conclude that fowl leukosis is an infectious disease and that it is transmitted by a filtrable virus. Control measures consist of careful culling, sanitation and use of breeding stock from resistant resources.

STUDIES ON THE MECHANISM OF IMMUNITY IN TUBERCULOSIS. The mobilization of mononuclear phagocytes in normal and immunized animals and their relative capacities for division and phagocytosis. Max B. Lurie. Jour. Exp. Med., lxix (1939), p. 579.

Tuberculous and vaccinated guinea pigs and rabbits mobilize mononuclear phagocytes at the site of a nonspecific inflammation with greater rapidity than do normal animals, just as they do respond to tubercle bacilli. The succession of cells that characterizes inflammation in general is accelerated in allergic rabbits and guinea pigs in response to nonspecific irritants. No constant relation was found between the mobilization of mononuclears and the hydrogen-ion concentration at the site of inflammation. The rate of mitotic and amitotic division of mononuclears in allergic rabbits and guinea pigs in response to nonspecific irritants is greater than in normal animals.

Mononuclears derived from actively tuberculous guinea pigs and rabbits exhibit greater phagocytic capacity for tubercle

bacilli than mononuclears from normal animals. The increased phagocytic activity of mononuclears derived from tuberculous or vaccinated rabbits and guinea pigs for tubercle bacilli and for nonspecific particulate matter occurs in medium containing sera from normal and tuberculous individuals. The rapid mobilization of mononuclears by immunized animals is associated with increased physiological activity.

STUDIES ON LISTERELLA INFECTION IN SHEEP. H. E. Biester and L. H. Schwarte. Jour. Inf. Dis., lxiv (1939), p. 135.

Extensive losses among sheep manifesting disturbances of the central nervous system were associated with the presence of a member of the genus Listerella. The histopathology of the infection was similar to some virus infections but the authors were unable to demonstrate the presence of a filtrable virus. Swine were more resistant than sheep to the intracerebral injection of pure cultures of *Listerella ovis*. Listerella of ovine origin remained viable for many months in brain tissues stored in sterile 50 per cent glycerin at refrigeration temperature.

EQUINE CONTAGIOUS PNEUMONIA (BRUSTSEUCHE, Ger.). John M'Fadyean. Jour. Comp. Path. and Ther., liii (1938), p. 255.

The disease has two causes which act separately and are responsible for different stages of illness and lesions. One, a virus, is exclusively responsible for the onset of the disease and primary lesions; the other, a streptococcus, is secondary and responsible for the pneumonia and accompanying pleurisy which gives the disease its serious character and is generally the cause of death. The virus is transmitted by contact and pathogenic only for the horse and ass. The period of incubation is unusually long, being from 18 to 39 days. The febrile stage is three to four days. The virus disappears from the body before the stage of pneumonia is reached. It produces a bronchitis only with no gross lesions in the parenchyma of the lungs and paves the way for the streptoccocus. The virus can be recovered only in the first stages of the disease. Subcutaneous and intravenous inoculations, with blood or virus-containing material, have failed. The disease was transmitted by rubbing virus-containing material into the mucous membranes of the nostrils or mouth. The streptococcus is indistinguishable from streptococci present in the air passages of normal horses.

J. F.

STUDIES ON EASTERN EQUINE ENCEPHALOMYELITIS. II. Pathogenesis of the disease in the guinea pig. Lester S. King. Jour. Exp. Med., lxix (1939), p. 675.

The virus of eastern equine encephalomyelitis injected peripherally in the guinea pig invades the blood stream and passes directly from the blood stream into the brain. This seemed to be the principle though not necessarily the exclusive mode of pathogenesis. After gaining access to the central nervous system the further spread of the virus may occasionally be determined by anatomical connections.

A MICROSCOPIC AGGLUTINATION TEST FOR THE DIAGNOSIS OF SWINE ERYSIPELAS. A. G. Karlson and S. H. McNutt. Jour. Inf. Dis., lxiv (1939), p. 49.

A microscopic agglutination test, a modification of the old microscopic Widal test for typhoid, is described as giving more reliable results than other agglutination tests already reported. Smooth cultures are selected for the preparation of the antigen. The antigen is a young, live broth culture. Dilutions of serum are made in watch glasses and hanging drops from each dilution are then prepared, which are examined microscopically after incubation for 15 minutes. Tests on hyperimmunized rabbits (five injections at four-day intervals) yielded positive titres of 1:6,400 to 1:2,000. Chronic swine erysipelas gave positive titres ranging from 1:200 to 1:400. The agglutination test applied to the serum of swine dead or dying of the acute or

septicemic form of the disease gave negative results.

SEROLOGIC TYPES OF SALMONELLA ISOLATED FROM PARATYPHOID IN CHICKS. Erwin Jungherr and Carl F. Clancy. Jour. Inf. Dis., lxiv (1939), p. 1.

In the routine examination of 1,241 lots of chicks less than three weeks old, 15 cases of paratyphoid infection were observed, as contrasted with 470 cases of pullorum disease and 756 nonspecific disorders. The lesions of paratyphoid infection ranged from inconspicuous alterations to those of omphalitis, peritonitis, pericarditis and sacculitis. Symptoms were more or less indefinite. Ten of the 15 cases occurred in pullorum-clean stock. A number of serologic types were found when the paratyphoid organisms were subjected to serologic study. All of the serotypes but *Salmonella anatum* which were observed in chicks have been found associated with gastrointestinal disturbances in man.

BOOK NOTICES

A Practical Cat Book

A Practical Cat Book is a valuable addition to the literature on *Felis Catus* (Linnaeus, 1758), the proper zoölogical name for cats (as the author promptly informs her readers). Biological science requires that this name replace *Felis domestica* (Gmelin, 1788), by which this genus of domestic animals is generally identified.

The book describes 33 breeds, most of which are illustrated by unusually good pictures. Detailed descriptions, including "show standards," are given, together with the known information concerning their origin. The chapter on "Breeding, Showing and Shipping" contains authenticated facts that anyone interested in cat fancy will want to know. The part on breeding would do credit to the expert geneticist.

The chapter on "The Mother Cat" gives the period of gestation as 62½ days, with variations, according to some authorities, between 55 and 69 days. The brief paragraphs on parturition are wholesome reading. The same may be said of the chapters on kittens, feeding, care and training, and such sundry subjects as tricks and games and how to photograph a cat.

A veterinarian reviewing this book is struck with the wisdom shown in the chapter on "Diseases and Parasites." On this technical portion, the author has wisely consulted outstanding figures in the veterinary profession who have qualified in feline medicine. Among these are W. M. Cameron of McGill University, E. L. Sanders of the New York Humane Society, Hugh E. Dailey of Angell Memorial Hospital, and others.

Cat fancy is advised against consulting veterinarians who "lack first-hand knowledge concerning feline habits, peculiarities and diseases," and those who would attempt to perform surgical operations without anesthesia, all of which is not hard to approve.

Veterinarians interested in feline practice should study this book. It contains information few men know about this much-misunderstood domestic animal. (*By Ida M. Mellen, zoölogist and author of many books and papers on wild, aquatic and terrestrial animals. For amateurs and professionals. Charles Scribner's Sons, New York and London, 1939. 230 pages, with 33 illustrations. Price, $2.50.*)

Medical Entomology

The title of the 1st and 2nd editions, which was "Medical and Veterinary Entomology," has been shortened to "Medical Entomology," without, however, removing any of the "veterinary" material. For this change we compliment the author, for in the title of a book dealing with the medical side of entomology, that word is superfluous. The arthropod pests of mammalian life can not be grouped to advantage according to the species they attack. Too many are omnivorous creatures. Otherwise stated, a book on medical entomology is veterinary

in spite of any title. One can approve the abbreviated title because it portrays the broad, the modern, the future conception of medical science, which now looks far beyond the human mammal in search of pathological facts.

Medical Entomology takes veterinary science at its full value in describing the habits, the ecology, the pathology and the life cycles of the insect parasites which play a rôle in the cause and transmission of disease. The era of the "man doctor" is passing into history as fast as that of the horse doctor, sheep doctor, dog doctor, etc. Medicine is beginning to imitate the ante-Æsculapian ancients who made little distinction between human and animal medicine. Through careful study of classical medical literature, of which *Medical Entomology* is an example, the prescient veterinarian senses a gradual return to unified medical science, which (to its own disadvantage) divorced animal medicine after centuries of alliance. The former left to veterinary science the task of building, without aid, a new and separate foundation. Now, the wisdom of coöperation, which obviously was not acknowledged—or perhaps not realized—at the time, is becoming apparent, and a rewelding of these two interests seems inevitable.

This third edition of a book on a sidelight of medicine carries its own recommendation. Needless to point out that it covers the subject of the relations of the Arthropoda to the diseases of the vertebrates studied in veterinary science—a subject dear to the heart of the veterinary profession, which claims historic achievements in medical entomology through pioneer work on insect vectors. This work ranges from the famous discovery of Smith, Kilbourne and Curtice on the Texas fever tick to that of Kelser of the veterinary corps, who was the first to demonstrate that insects carry the virus of such neurotropic contagions as equine encephalomyelitis. (*By William B. Hermes, professor of parasitology, University of California. Third edition. 582 pages, illustrated. The Macmillan Company, New York City. Price $5.50.*)

Crystaline Enzymes and Bacteriophage

Dr. John H. Northrop publishes the twelfth volume of the Columbia Series, entitled, "Crystaline Enzymes," containing the results of a group of investigations on the proteolytic enzymes which he carried out in the laboratories of the Rockefeller Institute for Medical Research, Princeton, N. J.

Pepsin, trypsin, chymo-trypsin, and carboxpeptidase and their inactive percursors, all of which have been isolated and prepared in crystaline form, are chemically described. While bacteriophage has been highly purified, it has not yet been crystalized.

The facile way in which enzymes split up proteins without the expenditure of energy or the evolution of heat is one of the marvels of biochemic processes. Artificially the chemical hydrolysis of proteins can be accomplished only by violent treatment and the expenditure of considerable energy. Although enzymes are not living matter, life can not exist without them. They are organic catalysts, governed by the same laws (theories) as the inorganic catalysts.

The book covers the following subjects in the order named: General Chemistry of Enzymes, Pepsin, Pepsinogen, Chymotrypsinogen and Chymo-trypsin, Trypsinogen, Trypsin and Trypsin-inhibitor, Carboxpeptidase, Bacteriophage, and the Preparation and Crystalization of Enzymes. Six pages of references, a good index and a revealing preface of pleasant reading add materially to the value of this volume.

(*Crystaline Enzymes, by John H. Northrop, member of the Rockefeller Institute for Medical Research, Princeton, N. J. 178 pages, with 35 tables and 48 illustrations. Columbia University Press, New York City, 1939. Price $3.00.*)

The ovary has two hormones: folliculin and progestin. The former is derived from the Graafian follicle and the latter from the corpus luteum.

THE NEWS

OF GENERAL INTEREST

Hotels for the A. V. M. A. Convention in Memphis, Tennessee

Hotel	Number of Rooms	Single Rates	Double and Twin Bedded
Adler	260	$1.25-$2.50 (with and without bath)	$2.00-$3.50 (with and without bath)
Ambassador	139	$1.25-$1.75 (with and without bath)	$2.00-$4.00 (with and without bath)
Chisca	400	$2.00-$3.50 (with and without bath)	$3.00-$5.50 (with and without bath)
Claridge	400	$2.50-$4.00	$3.50-$5.00 (double) $4.50-$7.50 (twin beds)
DeVoy*	150	$1.50-$4.00 (with adjoining or private bath)	$2.50-$6.00 (with adjoining or private bath)
Gayoso†	300	$2.50-$4.00 (with and without bath)	$3.50-$6.00 (with and without bath)
Parkview	300	$2.50-$3.00	$3.00-$4.00
Peabody	625	$3.00-$6.00	$4.00-$7.00 (double) $6.00-$8.00 (twin beds)
Tennessee‡	200	$2.00-$3.00	$3.00-$4.00 (double) $4.00 (twin beds)
Wm. Len§	250	$2.00-$3.00	$3.00 up (double) $4.00 up (twin beds)

*Overlooking the Mississippi River; seven blocks from Peabody Hotel.

†One block from convention headquarters.

‡Across the street from convention headquarters.

§One and one-half blocks from convention headquarters.

Those who are planning to attend the 76th annual meeting of the Association, in Memphis, Tenn., August 28 to September 1, will be interested in knowing the rates charged by the local hotels. A survey conducted with the coöperation of J. L. Arnandez, chairman of the Publicity Committee for the convention, reveals that the rates are reasonable and parallel those for similar accommodations throughout the country. Since about 3,000 conventions have been held in Memphis hotels during the past nine years, all of these establishments are thoroughly experienced in catering to large groups of people.

In the above table, ten of the leading hotels of Memphis are listed, with the rates in effect. (These rates, incidentally, are standard and prevail the entire year; they are not "ballooned" on any occasion.)

Rumors to the effect that hotel rates would be increased during the convention are without foundation, as we have received letters from the Memphis hotel association assuring the veterinarians of this country that the rates printed above are correct and will be those charged during the convention.

On the opposite page is a group of available hotels within convenient distance of the Peabody, where the meeting will be held.

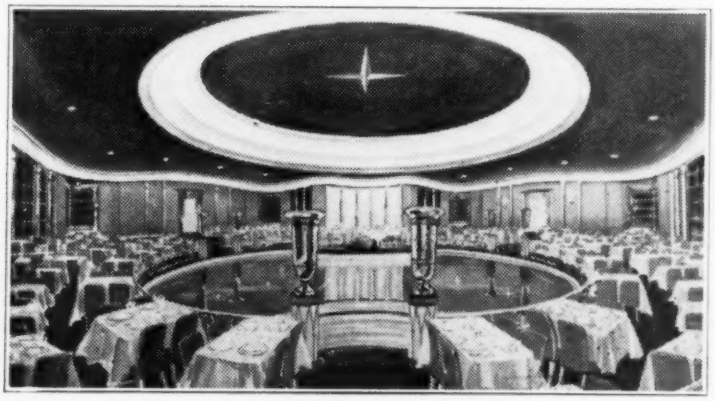
DeVoy Hotel

Lobby of the Gayoso

Hotel Chisca

Claridge Hotel

Wm. Len Hotel



Skyway Room of the Peabody

World's Fair Exhibit Fund

The Kansas State College student chapter of the Association has subscribed $15 to help finance the veterinary exhibit at the current New York World's Fair. This amount is composed entirely of ten-cent donations from each of the 150 members of the chapter. The Virginia State Veterinary Medical Association has voted a contribution of $90.

John R. Mohler, chairman of the committee in charge of the exhibit, announces that total subscriptions now amount to $3,163.20.

Synthetic Vitamin B_1

To Patton's recent discovery that synthetic vitamin B_1 (thiamin hydrochloride) cures fright disease of dogs, announced on page 594, may be added the report of the California Institute of Technology to the effect that dreaded tic douloroux of man responds to the same treatment. Borsook, Kremers and Wiggins* of that institute were able to bring about complete recovery in 42 out of 52 confirmed cases. The ten cases which did not respond were finally cured by the addition of large doses of concentrated liver extract. These two sensational announcements further confirm the close relationship between vitamin B deficiency and diseases attributable to nervous deterioration. Thus, three grave and formerly incurable afflictions (beri beri, tic douloroux and fright disease) have been placed unchallenged among the avitamoses.

*Drs. Henry Borsook, Marshall Yates Kremers and Charles G. Wiggins, National Academy of Sciences, 1939.

COMING MEETINGS

Houston Veterinary Association. Houston, Texas. June 1, 1939. W. T. Hufnall, Secretary, 1612-14 E. Alabama Ave., Houston, Texas.

Dallas-Fort Worth Veterinary Medical Society. Adolphus Hotel, Dallas, Texas. H. V. Cardona, Secretary, 2736 Purington Ave., Fort Worth, Texas.

Oklahoma Veterinary Medical Association. Artesian Hotel, Sulphur, Okla. June 5-6, 1939. F. Y. S. Moore, Secretary, McAlester, Okla.

Chicago Veterinary Medical Association. Hotel Sherman, Chicago, Ill. W. A. Young, Secretary, 157 W. Grand Ave., Chicago, Ill.

Small Animal Hospital Association. Los Angeles, Calif. June 6, 1939. R. W. Gerry, Secretary, 8474 Melrose Ave., Los Angeles, Calif.

Texas, State Veterinary Medical Association of, and Texas A. & M. College Short Course for Veterinarians. School of Veterinary Medicine, Texas A. & M. College, College Station, Texas. June 6-7, 1939. M. B. Starnes, Corres. Secretary, 202 City Hall Annex, Dallas, Texas.

New York City, Veterinary Medical Association of. Hotel New Yorker, New York City. June 7, 1939. C. R. Schroeder, Secretary, New York Zoölogical Park, Bronx, N. Y.

Georgia State Veterinary Medical Association. Everee Club, Griffin, Ga. June 13-14, 1939. J. E. Severin, Secretary, 357 Edgewood Ave. S. E., Atlanta, Ga.

Saint Louis District Veterinary Medical Association. Melbourne Hotel, Saint Louis, Mo. June 14, 1939. J. P. Torrey, Secretary, 610 Veronica Ave., East Saint Louis, Ill.

Ohio State University Veterinary Conference. Ohio State University, Columbus, Ohio. June 14-16, 1939. O. V. Brumley, Dean, Ohio State University, Columbus, Ohio.

Missouri Veterinary Medical Association. Jefferson Hotel, Saint Louis, Mo. June 15-16, 1939. C. L. Campbell, Secretary, 7224 Tulane St., Saint Louis, Mo.

Kansas City Veterinary Medical Association. Kansas City, Mo. June 19, 1939. S. J. Schilling, Secretary, Box 167, Kansas City, Mo.

San Diego County Veterinary Medical Association. Zoölogical Research Bldg., Balboa Park, San Diego, Calif. June 19, 1939. Glenn A. Tucker, Secretary, Vista, Calif.

American Association for the Advancement of Science. Milwaukee, Wis. June 19-24, 1939. F. R. Moulton, Secretary, Smithsonian Institution Bldg., Washington, D. C.

Eastern Iowa Veterinary Association, Ninth Annual All-Day Practitioner's Clinic. Dairy Cattle Congress Grounds, Waterloo, Iowa. June 20, 1939. C. E. Juhl, Chairman, Osage, Iowa.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. June 21, 1939. Charles Eastman, Secretary, 725 S. Vancouver Ave., Los Angeles, Calif.

Idaho Veterinary Medical Association. Idaho Falls, Idaho. June 26-27, 1939. E. M. Gildow, Secretary, University of Idaho, Moscow, Idaho.

California State Veterinary Medical Association. Santa Barbara, Calif. June 26-28, 1939. Chas. J. Parshall, Secretary, 319 B St., Petaluma, Calif.

Michigan State Veterinary Medical Association. Michigan State College, East Lansing, Mich. June 27, 1939. H. H. Clark, Secretary, 2601 E. Michigan Ave., Lansing, Mich.

Minnesota State Veterinary Medical Society. University Farm, Saint Paul, Minn. June 27-28, 1939. H. C. H. Kernkamp, Secretary, University Farm, Saint Paul, Minn.

Michigan State College Short Course for Veterinarians. Michigan State College, East Lansing, Mich. June 27-29, 1939. Ward Giltner, Dean, Michigan State College, East Lansing, Mich.

Massachusetts Veterinary Association. Boston, Mass. June 28, 1939. H. W. Jakeman, Secretary, 44 Bromfield St., Boston, Mass.

North Carolina State Veterinary Medical Association. Charlotte, N. Car. June 28-29, 1939. Pascal C. McLain, Secretary, Route 4, Charlotte, N. Car.

Ak-Sar-Ben Veterinary Medical Association. Omaha, Neb. July 10, 1939. J. D. Ray, Secretary, 1124 Harney St., Omaha, Neb.

Northwest Veterinary Medical Association. New Washington Hotel, Seattle, Wash. July 10-12, 1939. V. C. Pauhlman, Secretary, 1524 Fifth St., Chehalis, Wash.

Maine Veterinary Medical Association. Orono, Me. July 12, 1939. A. E. Coombs, Secretary, 1 Kennebec St., Skowhegan, Me.

New York State Veterinary Medical Society. Hotel Utica, Utica, N. Y. July 13-15, 1939. F. F. Fehr, Secretary, 243 S. Elmwood Ave., Buffalo, N. Y.

Ontario Veterinary Association. Royal York Hotel, Toronto, Ont. July 26-28, 1939. W. J. Rumney, Secretary, 612 King St. W., Hamilton, Ont.

World's Poultry Congress, Seventh Annual. Cleveland, Ohio. July 28-August 7, 1939. W. R. Hinshaw, Chairman, Section on Pathology and Disease Control, University Farm, Davis, Calif.

American Veterinary Medical Association. Memphis, Tenn. August 28-September 1, 1939. L. A. Merillat, Executive Secretary, 221 N. LaSalle St., Chicago, Ill.

State Board Examinations

Iowa Veterinary Medical Examining Board. June 13-14, 1939. All applicants must be in the office of the Division of Animal Industry not later than 8:00 a. m., June 13. Further information may be obtained from H. A. Seidell, Chief, Division of Animal Industry, State Capitol, Des Moines, Iowa.

Louisiana State Board Veterinary Medical Examiners. The next meeting for the examination of applicants will be held on June 14, 1939, in the office of the Live Stock Sanitary Board, Baton Rouge, La. Further information may be obtained from J. Arthur Goodwin, Secretary, New Iberia, La.

Nebraska Board of Veterinary Examiners. June 26-27, 1939. Further information may be obtained from Mrs. Clark Perkins, Director, Bureau of Examining Boards, State Capitol Bldg., Lincoln, Neb.

Oklahoma Board of Veterinary Medical Examiners. The next examination will be held in the Capitol Bldg., Oklahoma City, Okla., June 29-30, 1939. Further information may be obtained from W. C. McConnell, Secretary-Treasurer, Holdenville, Okla.

Connecticut State Board of Veterinary Registration and Examination. The next examination will be held in the office of the secretary, room 285, State Office Building, Hartford, July 5, 1939. Further information may be obtained from Geo. E. Corwin, Secretary and Treasurer, State Office Building, Hartford, Conn.

Illinois State Board of Veterinary Examiners. Examinations will be held in Chicago, July 24-25, 1939. Applications must be filed on blanks furnished by the Department of Registration and Education, Springfield, not later than 20 days before that date. The Board consists of W. W. Warnock, Aledo; W. H. Shaw, Pawnee, and L. A. Merillat, Chicago, Chairman. The fee is $20.00.

U. S. GOVERNMENT

Regular Army Service

Announcement is made of the appointment of First Lieutenant Don Lee Mace, Veterinary Corps Reserve, as first lieutenant in the Veterinary Corps, Regular Army, with rank from April 7, 1939. Lt. Mace is assigned to station at Edgewood Arsenal, Md. He will proceed to the Presidio of San Francisco, Calif., and report to the commanding officer for temporary duty until such time as will enable him to comply with this order, and will sail on the transport scheduled to leave San Francisco, Calif., on or about May 3, 1939, for New York, N. Y. Upon arrival, he will proceed to Edgewood Arsenal and report for duty.

Captain Wm. F. Collins is relieved from assignment and duty at Fort Sill, Okla., effective in time to comply with this order, and is assigned to the Army Veterinary School, Army Medical Center, Washington, D. C. At the proper time he will proceed to Fort Reno, Okla., and report to the commanding officer, Reno Quartermaster Depot, not later than June 1, 1939, for temporary duty for a period of approximately three months and will then proceed to Washington, D. C., and report on or about September 15, 1939, to the commandant, Army Veterinary School, for duty, for the purpose of pursuing a course of instruction.

Each of the following-named captains of the Veterinary Corps is relieved from assignment and station at the Army Medical Center, Washington, D. C., and from temporary duty at the Medical Field Service School, Carlisle Barracks, Pa., effective upon completion of the

present course of instruction on or about June 10, 1939, is then assigned to the station indicated after his name, and will proceed to that station to which assigned and report for duty:

Walter T. Carll, Fort Riley, Kan.

Thomas C. Jones, Front Royal Q. M. Depot, Front Royal, Va.

Wayne D. Shipley, Fort Moultrie, S. C.

Captain Donald C. Kelley is relieved from assignment and station at the Army Medical Center, Washington, D. C., and from temporary duty at the Medical Field Service School, Carlisle Barracks, Pa., effective at such time as will enable him to comply with this order, is then assigned to Fort Bliss, Texas. He will proceed at the proper time to New York, N. Y., and sail on the transport scheduled to leave that port on or about July 20, 1939, for San Francisco, Calif., and upon arrival therat will proced to Fort Bliss, Texas, and report for duty.

Lt. Colonel Wm. R. Wolfe is relieved from assignment and duty at Fort Logan, Colo., and additional duty as attending veterinarian at Fitzsimons General Hospital and Lowry Field, Denver, Colo., effective on or about June 25, 1939, is then assigned to Fort Robinson, Neb., and will proceed to that station and report to the commanding officer, Robinson Quartermaster Depot, for duty.

Lt. Colonel Peter T. Carpenter is relieved from assignment and duty at the Robinson Quartermaster Depot, Fort Robinson, Neb., effective on or about June 25, 1939, is then assigned to Fort Logan, Colo., and will proceed to that station and report to the commanding officer for duty. In addition, Lt. Colonel Carpenter will act as attending veterinarian at Fitzsimons General Hospital and Lowry Field, Denver, Colo.

The War Department has announced a competitive examination to be held from July 24 to July 29, 1939, both dates inclusive, for the purpose of qualifying Doctors of Veterinary Medicine for appointment as First Lieutenant in the Veterinary Corps of the United States Army to fill contemplated vacancies.

Graduates of recognized veterinary colleges are eligible for the examination provided they are not less than 22 9/12 years of age at the time of examination and will not be over 32 years of age at the time it is possible to tender them a commission.

Applicants will be authorized to appear before examining boards convened at Army stations in representative sections of the United States to conduct the examination.

Complete information and application blank will be furnished any interested veterinarian upon request to The Adjutant General, War Department, Washington, D. C.

Applications for this examination will not be considered if received after July 1, 1939.

Veterinary Corps Reserve

PROMOTIONS

To Captain: John Harvey Shoemaker, 962 Emerson St., Sheridan, Wyo.

SEPARATIONS

1st Lieut. Don Lee Mace, accepted appointment in Veterinary Corps, Regular Army, April 7, 1939.

Capt. Clyde Wilton Picht, honorably discharged, March 25, 1939, because of physical disability.

NEW ASSIGNMENTS TO ACTIVE DUTY WITH CCC

1st Lieut. David Ehrlich, Trenton, N. J.

1st Lieut. Absolom Berry Rich, Jr., Arizona Dist. CCC, Phoenix, Ariz.

1st Lieut. Darrell Bernard Sprott, New Mexico Dist. CCC, Fort Bliss, Texas.

TERMINATION OF ASSIGNMENT TO ACTIVE DUTY WITH CCC

1st Lieut. Milton W. Firestone, Schenectady, N. Y.

Farmer Called Best Friend of Wild Life

Farmers are potentially the most important group of wildlife conservationists in America, says Ira N. Gabrielson, Chief of the federal Bureau of Biological Survey.

Men of the soil, he says, usually have an inherent love for Nature and modern farmers have not seriously depleted any type of game. To the ranchers of the West, he says, great credit is due for preserving deer and antelope herds. Bobwhite quail have been encouraged almost universally on American farms, with the result that this species not only has been maintained on its original range, but also is now abundant in areas 2,000 miles away.

The future of wildlife in the United States, Dr. Gabrielson believes, rests largely with the farmers, since, he says, neither state nor federal governments can acquire sufficient land to assure general conservation measures for wildlife. Economists estimate that 55 per cent of the land in the United States in 1935 was in private farms and that at least an additional 30 per cent was leased or controlled by agricultural interests.

While it is true that certain game has been crowded out by farming, modern agricultural practices have improved the habitat of many wild birds and mammals and have extended their range. Bobwhite quail and the cottontail thrive under farming conditions. The ring-necked pheasant and the Hungarian partridge survive only on lands managed for agriculture.

AMONG THE STATES

Alabama

The Department of Agriculture and Fisheries has formulated regulations governing the quality of commercial dog foods. Through this action, Alabama becomes one of the few states where dogdom is protected from certain practices that have long remained irregulated.

Counting practitioners, Alabama Polytechnic Institute faculty, and members of the federal forces on duty in the state, the total number of veterinarians in the state appears to be 125. Of this number, 59 are known to be members of the national association. Since at least five of the spring graduates of A.P.I. will locate within the state, the slogan "65 Members by Memphis" has been adopted for the spring drive to make Alabama 50-50 A.V.M.A.

Reports have been received from two sections of the state of a condition resembling the western type of equine encephalomyelitis and, although unseasonable, are giving great concern to state authorities. Final diagnoses are awaiting the results of animal inoculations.

L. E. Beckman of Tuscaloosa reports that his county is starting a Bang's disease control program.

The foundation for the new $150,000 veterinary building at Alabama Polytechnic Institute is now completed and bids for the remainder of the structure are now being taken.

The response of southern practitioners to the new A.P.I. requirement of three months of interneship between junior and senior years is meeting with an excellent response. Veterinarians who can utilize the services of a student during the coming summer months are invited to write to Dr. L. E. Starr, Assistant Dean, Alabama Polytechnic Institute, Auburn, Ala.

R. L. Mundhenk, resident secretary for Alabama, writes:

> Better established veterinarians having assistants are strongly urged to do themselves, their helpers and the Association a good turn by advising the youngsters to file an application for membership in the national association. Following a tip from the executive secretary, we are "laying off" the hard-boiled veteran non-members and concentrating on the younger generation, who are more willing to listen and take heed of the advantages of membership in the Association.

Colorado

The Colorado Association of Dairy Products Manufacturers has passed a resolution disapproving the purchase of butter at a pegged price by the government, on the alleged grounds that such a practice is detrimental to producer, manufacturer and consumer.

District of Columbia

W. H. Wright, chief of the division of zöology, U. S. Public Health Service, Washington, D. C., has forwarded to the central office a copy of a letter, addressed to the late, lamented Maurice C. Hall, which he translated from the Spanish. This letter was written to

W. H. Wright, recently named chief of the division of zoölogy, National Institute of Health, United States Public Health Service, to succeed the late Maurice C. Hall.

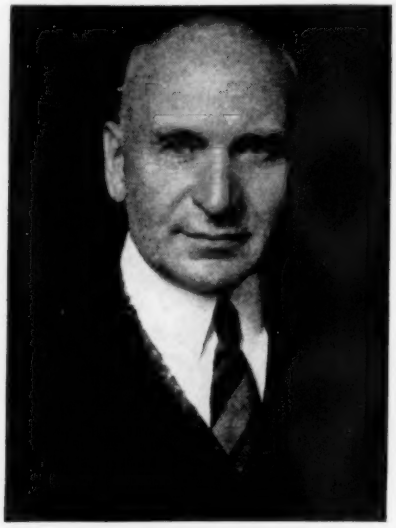
Dr. Hall by N. Almarza, a once prominent, now destitute veterinarian of revolution-torn Spain, who seeks refuge in some country which affords a livelihood. Dr. Almarza formerly was chief of the veterinary section of the Instituto Provinciale de Hygiene in Badajar and director general de Ganaderia e Industrias Pecuarias, Valencia. He was a delegate to the Thirteenth International Veterinary Congress and a member of the committee on the control of parasitic diseases.

The United States Public Health Service announced recently the discovery that the common gray mouse is a carrier of the germ which cause lymphocytic choriomeningitis, a disease of the central nervous system.

Five mice were trapped in two Cleveland, Ohio, homes where cases of choriomeningitis have appeared, and the active virus of the disease was found in three of them.

Dominion of Canada

The appointment of A. E. Cameron of Ottawa as veterinary director general was announced on May 1. Dr. Cameron, who served since 1925 as chief veterinary inspector, health of animals service, Dominion Department of Agriculture,



A. E. Cameron

succeeds George Hilton, who retired on superannuation in July of 1938. In his new capacity Dr. Cameron is responsible for the administration of the Animal Contagious Diseases Act and the Meat and Canned Foods Act.

He graduated with honors from the Ontario Agricultural College in 1908 and after a short period in private practice entered the meat inspection service, Dominion Department of Agriculture. In 1910 he was transferred to the contagious diseases division in Saskatchewan. Three years later he went to the pathological division of the Veterinary Research Station, Lethbridge, Alberta. During the war, in May, 1915, Dr. Cameron was appointed veterinary officer, 6th Canadian Light Infantry Brigade, and went to France in charge of the horses of the brigade. He served with distinction during the war and was awarded the Military Cross. After demobilization he returned to the Veterinary Research Station at Lethbridge and in 1925 was appointed chief veterinary inspector, with headquarters in Ottawa.

Dr. Cameron has represented Canada since 1932 on the Executive Board of the A.V.M.A. He is a member of the associate committee on parasitology, National Research Council, a member of the Canadian Public Health Association, the United States Live Stock Sanitary Association, and the American Society of Parasitologists. He is vice-president of the Central Canada Veterinary Association.

Georgia

When the Georgia State Veterinary Association meets on June 13, the usual banquet will be replaced by an outdoor barbecue. The meeting proper will be held at the Everee Club, about two miles south of Griffin, Ga. The barbecue will be held at the little club house just across the road, among the pines on the shore of a 28-acre lake.

Illinois

The laboratory of animal pathology and hygiene at the University of Illinois now has three film strips available in connection with animal pathology extension work. These films illustrate the methods of preventing many of the major diseases of poultry, cattle and swine.

Only three copies of each strip are available, but if Illinois veterinarians wish to show them in their community, they will be furnished in the order in which requests are received. Quite a few veterinarians have used the films at local meetings and report that they have proved valuable. In order to show them, a 35-mm. double-frame film-strip projector is required. Many farm advisers have the necessary projectors and have indicated their willingness to coöperate in educational work. The laboratory has made arrangements to show the film strips at certain local veterinary meetings.

A 16-mm. movie film on rabies is also available. Persons interested in securing this service should address the Division of Animal Pathology and Hygiene, University of Illinois, Urbana, Ill.

The equine encephalomyelitis immunity tests now under way at the University suggest that horses vaccinated by the two-dose chick embryo method are immune to intracerebral inoculation eight months later.

Iowa

H. D. Bergman of Iowa State College, Ames, will wind up his itinerary as president of the Association by a visit to the Pacific coast, where he will address a number of meetings.

Kansas

C. W. Bower edits a special feature, "With Our Veterinarians," in the bimonthly *Kansas Stockman*, official publication of the Kansas Livestock Association. Articles appearing in this department are written by prominent veterinarians, Dr. Bower soliciting outstanding manuscripts for each issue.

The issue of April 15 carried an article by Kent R. Dudley entitled, "Ourselves," which

had been presented before the annual convention of the Kansas Livestock Association at Wichita, Kan., March 3, 1939. In the paper, he surveyed the achievements of the live stock industry as a whole, pointed out some of the problems that have arisen in recent years and commented on the broadened scope and social importance of the industry. He advanced several significant views on the personality of the successful stockman and emphasized that proper attitude and coöperative effort on the part of each individual are imperative to the stability of the industry as a whole. Dr. Dudley discussed briefly but specifically the contributions of veterinary medicine to the success and prosperity of the live stock industry.

New Jersey

On Tuesday, May 9, about 30 veterinarians attended a testimonial dinner given at New Brunswick, N. J., in honor of F. R. Beaudette, poultry pathologist at the New Jersey agricultural experiment station. Last year Dr. Beaudette offered his services to practicing veterinarians desiring to review poultry diseases and familiarize themselves with recent developments in this direction. Weekly lectures beginning in September, 1938, and ending in February, 1939, supplemented by a quantity of clinical material, laboratory work and actual diagnosis, were enthusiastically received by a large number of attending practitioners.

In addition to the expressions of appreciation voiced by those present at the dinner, numerous messages were received from those unable to attend.

New Mexico

The prevalence of rabies among dogs, reported in press releases early in the spring, continues to be an annoying situation, prominent practitioners state.

New York

The commission of scientists, health officers, bench show representatives and veterinarians, convened in New York City by the American Kennel Club on May 2 and May 16, is reported to be sponsoring a movement to develop rational views on the so-called rabies problem. . . . The rotary milker of the Borden Company at the New York World's Fair is one of the exposition's outstanding attractions. . . . The veterinarians' exhibit at the New York Fair, sponsored by the A.V.M.A. and located among the exhibits of the other branches of medicine, was dedicated on May 19 in the presence of a large group of interested spectators.

North Carolina

A $40,000 dairy research plant will be built at Wilmington by the WPA. Plans call for modern barns, maternity sheds, calf pens, bull pens, silos and general improvement of a 125-acre farm.

Ohio

Two important events in veterinary medicine are to be staged in the Buckeye state during the next two months. First, the Ohio State University Veterinary Conference, at the University, Columbus, June 14-16; and second, the Seventh Annual World's Poultry Congress at Cleveland, July 28-August 7.

That rabies is a disease concerning farming is confirmed by a report from C. F. Runnels of the death of nine sheep at Saint Clairsville, due to the bites of a single rabid dog.

The state legislature has appropriated $350,000 to continue the Bang's disease program through the next two years.

Pennsylvania

In the 71st annual report of the Pennsylvania Society for the Prevention of Cruelty to Animals, there was published the following condensed statement of income and expenses for the year ended December 31, 1938:

INCOME

Memberships		$ 1,135.00
Donations—General Fund	$ 451.65	
Small Animal Fund	424.74	
Dispensary Fund	1,789.68	
		2,666.07
Emergency Ambulances		1,164.38
Net Income from all other sources		60,044.69
		$65,010.14

EXPENSES

Humane Work—Investigating Complaints, Preventing Abuse	$26,792.00
Emergency Ambulance Service	15,293.21
Dispensary	5,251.55
Humane Education	7,464.71
Headquarters—Repairs and Maintenance	1,937.83
Administration, Office, etc.	3,822.06
New Equipment	2,316.00
Unexpended Income	2,132.78
	$65,010.14

Tennessee

John H. Gillman, of Memphis, chairman of the Committee on Local Arrangements for the A.V.M.A. convention will attend the meeting of the Missouri State Veterinary Medical Association at Saint Louis, Mo., June 15-16. He will tell about the activities of the Committee and the plans that are being made for this important event.

A transcript of the minutes of the monthly meetings of the Committee indicates that the horse and mule clinic, under the direction of William L. Gates of Clarksdale, Miss., will be a feature event of the meeting.

J. L. Arnandez, also of Memphis, has been a consistently hard and spirited worker as chairman of the Publicity Committee for the convention, spending practically all of his spare hours at this task. Recently he conducted a careful survey of the accommodations and rates of Memphis hotels, and sent on this information to the central office.

During the month of April one suspected outbreak of anthrax, in Fayette county, was reported in the state. Two outbreaks of blackleg were recorded, and there was one suspected outbreak of rabies in Bedford county. There were six outbreaks of septicemia in that month, 30 of erysipelas and 58 of hog cholera. The latter disease struck fiercely at Hamblen county, there being ten outbreaks in the area.

Texas

San Antonio has a zoölogical garden containing more than 1,650 animals, not to mention one of the greatest collections of living birds in the world. Among its attractions are the barless bear terraces, Primate paradise with a monkey island, the hippopotamus pool and the anthropoid house.

Washington

The Washington association publishes a quarterly bulletin edited by the officers—V. C. Pauhlman, Secretary; R. R. Isham, President; and J. P. Johnson, Vice-President. It is a newsy bulletin telling what transpires in that neck of the woods, without notable omission.

A meeting of the Western Washington section of the Association was held in Seattle on April 15. The Northwest Veterinary Medical Association will hold its annual meeting in Seattle, July 10-12. The Seattle Veterinary Medical Society met at the hospital of George Ruggles on the evening of March 13 to plan for this annual. Headquarters will be at the New Washington Hotel, where space will be provided for exhibitors. Outstanding speakers are promised.

Wisconsin

Mr. M. S. Dudgeon, librarian of the Milwaukee public library, writes:

> Thank you very much for the set of Veterinary Military History, presented to this library. These books are a valuable addition and the board of trustees join me in thanking you for this present.

The books were presented to the Milwaukee Public Library through J. A. Patton, Inspector-in-charge, Bureau of Animal Industry, Milwaukee.

Poultrymen of the Wisconsin station reassert the contention that coccidiosis not only takes its toll by the death of chicks but also by states of ill health which linger through life.

MEETING REPORTS

American Animal Hospital Association, Miami Meeting

By the small but very significant number of three, the record for previous attendance at A.A.H.A. meetings was shattered as the Association convened at the Miami Biltmore Hotel, Miami, Fla., March 23-25. S. W. Haigler of Saint Louis, Mo., presided.

A well balanced program of fine scientific papers and general subjects dealing with current problems and questions filled out the three-day proceedings. A listing of the topics and speakers follows:

"Radiography and Physical Therapy," G. B. Schnelle, Boston, Mass.

"Where Do Our Profits Come from and Where Do They Go?" E. B. Dibbell, Baltimore, Md.

"Proper Hospital Equipment a Sound Investment," J. Stuart Crawford, New Hyde Park, N. Y.

"Practical Suggestions for the Construction of a Modern Dog and Cat Hospital," Joseph B. Engle, Summit, N. J.

"Canine Urology and Urologic Diagnosis in Practice," A. R. Theobald, Cincinnati, Ohio, and E. C. Khuen, Evanston, Ill.

"A Year's Achievement in Canine Orthopedic Surgery," Otto Stader, Ardmore, Pa., and E. F. Schroeder, Boston, Mass.

"Need of Standard Records and Means of Accurate Record Keeping," J. A. S. Miller, Deal, N. J.

"Some Diseases Traceable to Atypical Ovarian Function," Joseph DeVita, New Haven, Conn.

"Commercial Dog Foods—Their Chemical and Biological Evolution," M. L. Morris, New Brunswick, N. J.; H. H. Mitchell and B. W. Fairbanks, University of Illinois, Urbana, Ill.

"The Diagnosis of Some Newer Canine Diseases," Norman J. Pyle, Pearl River, N. Y.

"Improved Surgical Technic and Demonstrations," C. P. Zepp, New York, N. Y., and L. W. Goodman, Great Neck, L. I., N. Y.

"Biology, Host Relationship and Identification of Ticks Infecting Dogs in Florida," H. Hixson, College of Agriculture, University of Florida, Gainesville, Fla.

"Canine Piroplasmosis," H. M. Clarvoe, Tampa, Fla.

"Some Laboratory Methods Used in Demonstrating *Babesia Canis*," D. A. Sanders, Experiment Station, University of Florida, Gainesville, Fla.

"Canine Filariasis," C. E. Bild, Miami, Fla.

"Canine Coccidiosis," John R. Wells, West Palm Beach, Fla.

An election of officers was held, the following men being selected to serve for the ensuing year: L. H. LaFond of Detroit, Mich., president; J. B. Engle of Summit, N. J., first vice-president; and L. W. Goodman of Great Neck, L. I., N. Y., second vice-president. D. A. Eastman of Moline, Ill., was reëlected secretary and A. R. Theobald of Cincinnati, Ohio, was chosen to serve again as treasurer. E. B. Dibbell of Baltimore, Md., was elected to the executive board to succeed Otto Stader of Ardmore, Pa.

District of Columbia Veterinary Medical Association

The District of Columbia Veterinary Medical Association held its second quarterly meeting of 1939 at the Mayflower Hotel, Washington, D. C., on the evening of April 25, H. W. Schoening presiding. An exceptionally large group of practicing army and federal veterinarians from Maryland, Virginia and the District of Columbia were in attendance.

The guest speaker was Benjamin Schwartz, chief of the zoölogical division of the United States bureau of animal industry. Talking on the subject of trichinosis, Dr. Schwartz brought to the front many illuminating facts. He pointed out that in a sectional survey, in progress for nearly two years and near completion, 25,000 hog diaphragms were examined for trichinae and, out of these, less than 1 per cent was found to be trichinous. Hogs in certain sections of the country, he explained, are affected more extensively than those in other sections. E. C. Joss followed up Dr. Schwartz's talk with an interesting discussion on the same subject.

Lt. Col. R. A. Kelser of the veterinary corps, United States Army, gave a short talk on veterinarians in public health. He stated that it is now possible for the veterinarian to attend the school of public health at Harvard University, where he may receive a certificate of public health, although he added that such a certificate is not a degree. The class is to be attended by a selected group of physicians and veterinarians interested in public health problems, Colonel Kelser explained.

Motion pictures on the "Ovulation, Fertilization and Early Development of the Mammalian Egg" concluded the meeting.

WM. M. MOHLER, *Secretary.*

Houston Veterinary Association

A round table discussion of local problems and reports of several cases were the high points of the April meeting of the Houston Veterinary Association, held at Houston, Texas. Don Strickler, inspector-in-charge of the United States bureau of animal industry station at Houston, was a speaker on the program as well as the author of the monthly questionnaire. F. N. Jenkins won first prize in this event, which is a standard and always well received feature of the Association's gatherings. Archie Stallings took second prize.

MAY MEETING

On May 4 the group convened in the assembly hall of the Houston chamber of commerce building. Of the 100 attending, over 50 were senior veterinary students of the Texas A. & M. College, College Station, Texas.

The main feature of the program was a paper presented by H. L. Van Volkenberg, professor of veterinary parasitology at the Texas A. & M. College on "Species of Helminth Parasites Found in Domestic Animals of Texas." Ross P. Marsteller, dean of the school of veterinary medicine of the College, gave a short talk and, following, introduced each attending senior to the members of the Association.

Other speakers on the program were: Frank Hecker, on "What the Practicing Field Offers the Coming Generation of Veterinarians"; Don Strickler, on "What the Federal Field Offers the Coming Generation of Veterinarians"; and J. Gilbert Horning, on "What an Active Local Association Means to the Veterinarian in Any Field."

F. N. Jenkins presented the monthly questionnaire, Madero N. Bader, president, winning first prize among the members. Two of the visiting students, Herschel H. Payne and Drue S. Ward, tied for first prize among the college group.

Seven prominent figures in veterinary medicine were elected to honorary membership in the Association. They are as follows: Ross P. Marsteller, H. L. Van Volkenberg and A. A. Lenert—all of the school of veterinary medicine, Texas A. & M. College; Sir Frederick Hobday and Major George W. Dunkin, of London, England; and Hans Hansen and Folmer Neilsen, of Copenhagen, Denmark.

J. GILBERT HORNING,
Corresponding Secretary.

Northeast Kansas Veterinary Medical Society

The Northeast Kansas Veterinary Society met in Topeka, Kan., at the Jayhawk Hotel on Friday, April 7. The meeting was called primarily for the purpose of working out a veterinary service plan for farmers having loans with the Farm Security Administration, this subject having been first brought to the attention of Kansas veterinarians at the meeting at Manhattan in February. A plan was presented by Mr. Winchester, one of the Farm Security officials, whereby the veterinarian is to make two inspection calls a year, one in the spring, and one in the fall for a general check up of the live stock on the farm, the veterinarian to do any work necessary at that time. It was agreed that the Administration would loan each client desiring such service a minimum of $24 per year, plus $3 per head for vaccinating his horses against sleeping sickness, plus 20 cents per animal unit for over 15 animal units. There were 23 veterinarians present and the opinion was divided as to whether or not they would sign such an agreement. There is an average

of 100 Farm Security clients in the eastern half of Kansas,

SOUTHEAST KANSAS
VETERINARY MEDICAL SOCIETY

On Friday, April 14, there was another such meeting held at Parsons, Kan., with 25 veterinarians present, this being the Southeast Kansas group. It seems that the consensus of opinion is to go ahead and sign up these agreements and try the thing out. There is nothing to prevent a veterinarian from dropping out any time he is dissatisfied with such an arrangement.

Various phases of encephalomyelitis were discussed at each of these meetings, and vaccination against this disease is being started in several localities.

R. F. COFFEY,
A.V.M.A. Secretary for Kansas.

Kansas City Veterinary Medical Association

"A real practitioner's program"—this might well have been the motto of the recent monthly meeting of the Kansas City Veterinary Medical Association, held at the Hotel President in Kansas City, Mo., on Wednesday evening, May 17.

Featured on the program were H. J. Hearrington of Lexington, Mo., who discussed plant poisoning and toxicology, and L. D. Frederick of Chicago, Ill., who gave a paper on the biological evolution of dog food. Both of the speakers adapted their presentations to fit the specific needs and to help solve many of the current problems of the practitioner.

A characteristic of each meeting of the Association is the enthusiasm shown and the active part taken in the proceedings by every member in attendance.

S. J. SCHILLING, *Secretary-Treasurer.*

Southwestern Iowa Veterinary Medical Association

The 14th semiannual meeting of the Southwestern Iowa Veterinary Medical Association was held at the Chieftain Hotel, Council Bluffs, Iowa, on April 4. One hundred veterinarians and their wives attended.

The literary portion of the program was composed entirely of ten-minute talks supplemented by five-minute discussions. A roll of the subjects and speakers follows:

"Pathology of Equine Encephalomyelitis," H. J. Shore, Fort Dodge, Iowa.
"Chick Encephalomyelitis Vaccine," C. L. Campbell, Saint Louis, Mo.
"Anaphylaxis," Ashe Lockhart, Kansas City, Mo.
"Physiology of Respiration in Ducks," E. A. Hewitt, associate professor of veterinary physiology, Iowa State College, Ames, Iowa.
"Respiratory Disease of Baby Chicks," C. D. Lee, Veterinary Research Institute, Iowa State College, Ames, Iowa.
"Wheat-Germ Oil," S. H. McNutt, Veterinary Research Institute, Iowa State College, Ames, Iowa.
"Artificial Insemination," R. L. Anderes, Kansas City, Mo.
"Cocklebur Poisoning," Frank Breed, Lincoln, Neb.
"Report of Division of Animal Industry," H. A. Seidell, Chief, Des Moines, Iowa.
"Report of United States Bureau of Animal Industry," J. A. Barger, Inspector-in-charge, Des Moines, Iowa.
"Bovine Cervicitis," F. E. Walsh, Division of Veterinary Medicine, Iowa State College, Ames, Iowa.
"Hydrocyanic Acid Poisoning," T. W. Munce, Sioux City, Iowa.
"Nephritis of Cattle," J. D. Ray, Omaha, Neb.

The dinner program was devoted entirely to a banquet and entertainment. George Wessels served as toastmaster and introduced a number of speakers. R. Fred Eagle assisted Dr. Wessels in the program and, in addition, delivered an excellent address.

The first Tuesday in April and October has been established as a permanent date for future meetings.

GEORGE B. SENIOR, *Secretary.*

Veterinary Medical Association of New York City

A meeting of the Veterinary Medical Association of New York City was held at the Hotel New Yorker, New York City, on Wednesday evening, April 5, J. B. Engle presiding.

Norman Pyle, chairman of the program committee, introduced the guest speaker of the evening, William James, M.D., of the college of medicine, Cornell University, Ithaca, N. Y. He talked on "Experiments on Behavior and Its Relation to Physical Form in Dogs," using lantern slides and motion pictures to illustrate the subject.

Following, several cases were reported upon and discussed. E. R. Cushing presented "Prostatitis in an Old Dog"; J. J. Merenda contributed "Piroplasmosis in Dogs and Related Tick Infestation"; N. Wernicoff reported on "Osteomyelitis in the Radius of a Dog," using lantern slides to illustrate the subject; and D. A. Yandell presented "The Use of Pitocin in Caesarian Operations."

The special committee on attendance submitted several proposals aimed to govern attendance at the meetings more closely. Chief among their recommendations was that ten courtesy or guest cards be given each member on payment of dues to permit him to invite guests. This was discussed and passed, and appropriate guest cards, pocket size, have been printed and distributed. A move by C. E. DeCamp that the membership roll of the Association, as of April, 1939, be printed in booklet form for distribution to members was seconded and passed. These

booklets were printed and mailed a short time ago.

C. R. SCHROEDER, *Secretary.*

Society of Phi Zeta

A meeting of the Iowa State College Gamma chapter of Phi Zeta, an honorary society in veterinary medicine, was held at Iowa State College, Ames, Iowa, on April 21. The following were elected to active membership.

Class of 1939:

Melvin S. Hofstad
Donn E. Bacon
Gerald E. Brandt
Donald F. Werring
Lloyd L. Boxwell
Aaron P. Antroinen

Class of 1940:

Clarence E. Dee
Andrew L. McGrath
Henry P. Shoeman
James D. Ramsey
William E. Irwin
Marcus E. Boyer
Willis A. Liebsch
Ernest D. Mack
William D. Daugherty

Faculty Members:

L. E. St. Clair
Walter G. Venzke

Honorary Members:

H. J. Shore, Fort Dodge, Iowa
C. E. Juhl, Osage, Iowa.

L. H. SCHWARTE, *Secretary-Treasurer.*

Kansas State College Student Chapter of A.V.M.A.

Kansas State's "Men in White," junior members of the national association, honored twelve of their number on April 22 at the most successful dinner-dance of the social season. More than 200 couples attended the affair, which was held in the ballroom of the Wareham Hotel, Manhattan, Kan.

The honor certificates and the accompanying cash awards, totaling $100, were presented. Awards were made as follows: In physiology—William D. Bowerman of Oklahoma City, Okla., and Bernard Busby of Wakefield, Neb.; therapeutics—Roger G. Spencer of Whiting, Kan., and Carl F. Erickson of Aurora, Kan.; pathology—Edgar L. Taylor of Henryetta, Okla., and Morris A. Nossov of New York, N. Y.; small animal clinic—Guy A. Railsback of Landon, Kan., and Marion C. Alson of Carthage, Mo.; general proficiency—Norwood H. Casselberry of Savanna, Ill., and Wade O. Brinker of Massillon, Ohio; case reports written for *Veterinary Medicine*—P. J. Germanio of Belleplain, N. J., and Marion C. Alson of Carthage, Mo.

The cash awards of these prizes were made possible through the generosity of N. D. Harwood, '18; C. W. Bower, '18; O. M. Franklin, '12; Benjamin F. Pfister, '21; Earl F. Hoover, '24; C. E. Salsbery, K.C.V.C. '11; and D. M. Campbell, K.C.V.C. '07.

L. A. Merillat, executive secretary of the national association, was the guest speaker. In his address, he discussed the advances in veterinary medicine that he has observed in his 51 years of professional service. Many of these advances, Dr. Merillat pointed out, are attributable directly to the organizing influence of the A.V.M.A.

PERSONAL NOTES

Birth

TO DR. AND MRS. L. A. BOWSTEAD of DeWitt, Iowa, a son, John Allen, April 3, 1939.

Activities

R. G. BOSE (N. Y.-Amer. '01) of Troy, N. Y., is suffering from a severe nervous breakdown.

A. E. BOTT (Chi. '13) was recently elected president of the board of education of East Saint Louis, Ill.

W. C. SPRINKLE (T. H. '11) of Terre Haute, Ind., is building a new, up-to-the-minute small animal hospital, with living quarters on the second floor.

FRANK HARE (K. S. A. C. '20) of Lexington, Ky., has been appointed to the Kentucky state board of veterinary examiners to succeed G. P. Isbell (McK. '08) of Louisville.

FRANK G. HAHN (Cin. '04), assistant veterinarian at Cincinnati, Ohio, was retired from the service of the United States bureau of animal industry on April 30, 1939.

J. J. STREETS (Iowa '86) of Ventura, Calif., has retired and E. H. Houchin (Wash. '24), also of Ventura, has taken over his practice. Dr. Streets has been a member of the Association for 29 years.

M. J. HUGGINS (Chi. '13) of Edwardsville, Ill., who has served as veterinarian for Madison county for the past 15 years, will retire from that office at the end of his present term to enter private large animal practice.

C. A. BRANDLY (K. S. A. C. '23) has been appointed senior veterinarian of the regional poultry research laboratory at East Lansing, Mich. He was formerly associate chief of the department of animal pathology and hygiene at the University of Illinois.

FRANCIS C. YABSLEY (Chi. '17) of Cissna Park, Ill., while removing the placenta of a mare, was kicked and thrown to the ground by the animal, with the result that his left leg was broken. Latest reports indicate that he is recovering satisfactorily.

C. R. ROBERTS (Corn. '22) of Leonia, N. J., has been elected to the board of directors of Sheffield Farms Company, Inc., New York City. Robert M. Wellwood, who is head of the company's creamery department. Dr. Roberts joined the firm in 1930.

DEATHS

E. F. Kinsley of Laramie, Wyo., died of a heart attack at the age of 50 on May 7, 1939.

Born at Oketo, Kan., on October 13, 1888, Dr. Kinsley was graduated from the Kansas City Veterinary College in 1911. For four years after graduation he was employed in serum plants in Kansas City. In 1916 he moved to Laramie, practicing there until his death. He had been deputy state veterinarian since his first year of residence in Wyoming. Dr. Kinsley joined the national association in 1938.

Among his survivors are three brothers, two of whom are veterinarians—A. T. Kinsley (K. C. V. C. '04) and Chris Kinsley (K. C. V. C '05).

Alexander F. Malcolm of Occoquan, Va., died at the age of 56, following a heart attack, on April 18, 1939.

Dr. Malcolm was graduated from the United States College of Veterinary Surgeons in 1917. For more than a quarter of a century he had served as veterinarian for the Lorton Reformatory (District of Columbia prison farm).

W. G. Clark of Marinette, Wis., died on April 6, 1939, at the age of 71.

Born in Richmond, Wis., October 6, 1868, Dr. Clark attended the Chicago Veterinary College, from which he was graduated in 1893. For two years afterward, he served as an instructor in the agricultural division of the University of Wisconsin. Following, he established practice at Beaver Dam, Wis., remaining there for two years. Then he moved to Marinette, where he was active professionally until January, 1939.

Dr. Clark joined the national association in 1900. He was a Mason and a charter member of the Kiwanis club. Throughout his entire residence in Marinette he was a leader in church and civic affairs.

H. F. Vulliamy of Donaldsville, La., veteran of three wars and one of the oldest practicing veterinarians in Louisiana, died at his home at the age of 74, on April 28, 1939.

Born in England, he was graduated from the Ontario Veterinary College in 1891. Immediately after graduation he emigrated to the United States and became a naturalized citizen. He had practiced in Donaldsville since 1920. In addition to carrying on his practice he had served in the United States bureau of animal industry on Bang's disease and tuberculosis for about three years, retiring in 1937 because of ill health.

Dr. Vulliamy was a veteran of the Boar Spanish-American and World Wars. He was a past vice-commander of the American Legion and an officer and past national commander of the veterans of the Spanish-American War. He was a Mason and a member of the Elks and was an important figure in church and civic affairs.

Dr. Vulliamy became a member of the national association in 1908.

Peter T. Keeley of Waterbury, Conn., died at his home on March 13, 1939, at the age of 70.

He was graduated from the New York College of Veterinary Surgeons in 1894. Dr. Keeley moved to Waterbury shortly after his graduation. For 27 years he had been a member of the Connecticut State Board of Veterinary Registration and Examination and had served as city dairy, milk and food inspector in Waterbury for 36 years. He was an enthusiastic sports follower, particularly of boxing and horse racing, and was chosen secretary of the state boxing commission in 1924. He was one of the oldest members of the Waterbury lodge of Elks.

Dr. Keeley joined the national association in 1907. He was also a member of the Connecticut Veterinary Medical Association.

G. E. C.

Hobson W. Graves of Union, S. Car., died at the age of 40 on March 24, 1939. Born at Jefferson, S. Car., November 12, 1898, he was graduated with honors from the Alabama Polytechnic Institute in 1924. Dr. Graves had devoted much of his professional career to city health work. He was a Rotarian and a member of the South Carolina Association of Veterinarians.

He joined the national association in 1927.

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of the
American Veterinary Medical Association

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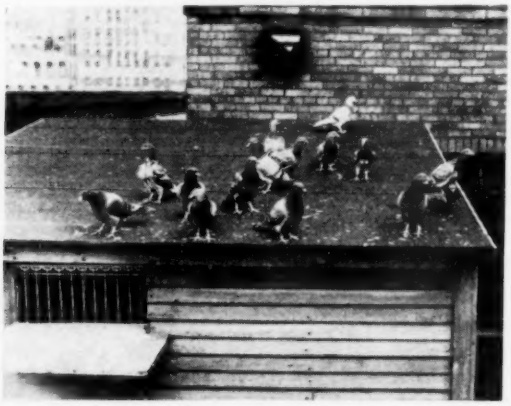
Animals That Make the News

To keep in step with the demands of a world that deifies Speed and to strike out many upsets at deadline, modern journalism now looks to a dependable servant of war—the racing pigeon—to carry . . .

. . . *Photos from the Sky*

AN INNOVATION in journalism that is rapidly spreading to newspaper fronts in all parts of the country is the use of the racing pigeon to air-express spot photos from scenes of news events.

For quite some time one of the leading New York City papers has utilized the racing pigeon to bring in pictures from boats approaching the harbor. When prominent passengers are aboard the incoming vessel, a photographer takes two or three pigeons and rides out to the liner in a speedboat.



A fleet of racing pigeons in the training headquarters high atop the Times building in Chicago. Note the barred entrance to the loft in the left hand corner. The instant a bird returns from an errand and touches one of the bars to enter the loft, a bell rings in the editorial office on the fourth floor, informing of the arrival.

After he has snapped the necessary pictures, he inserts them in carrier tubes and fixes these firmly to the birds. Upon release, the pigeons race homeward to the editorial office. Often before the boat has docked an edition carrying the pictures is on the newsstand.

During the past few months the Chicago *Times* has been carrying on a training program for a flock of 20 "air-express" pigeons which will be employed to carry spot news pictures primarily from baseball parks and racetracks. They will be assigned to accompany staff photographers working within a radius of about 100 miles. Their chief value lies in the fact that they are able to fly pictures back to the editorial office in a fraction of the time required by the photographer to battle his way through heavy traffic.

The racers are schooled under carefully regulated conditions. Young pigeons only are used, since old birds brought in from service elsewhere are inclined to return to their former habitat when released. After a number of weeks of confinement in the loft, the youngsters are let out at dusk. In this way, they fly only a short distance, returning before darkness prohibits flight. Never are they fed before being sent out; hence, it is almost a certainty that they will return.

In preparing the racers for service, the trainer transports them to a slightly greater distance each time and they are trained to fly from all points. A very careful, individual record is kept of each bird. Each is banded with a number and identification. In addition, every pigeon in the flock is given a name. This is done essentially for publicity purposes, in the event that one should bring in an epoch-making "scoop."

It is important, especially in a large city like Chicago, that the loft be situated at a high altitude; otherwise the many tall buildings would impede the bird's flight.

Many racing pigeons have been known to average more than a mile a minute in flight and have returned safely to their owners from distances as great as 1,300 miles.

(*Continued on page xviii*)

NEMBUTAL

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Introduced by Abbott Laboratories eight years ago, Nembutal rapidly won wide acceptance in veterinary practice. Today it is the most widely used barbiturate for surgical procedures.

Nembutal produces a relatively short hypnotic effect and has a profound sedative action, anesthesia lasting one-half to one hour depending on the amount administered. It possesses a wide margin of safety when used in the proper amounts.

The average dosage for small animals is 1 grain for each 5 pounds of body weight. However, investigators have established a varying tolerance depending on breed, age and condition.

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Breed..... No.....

Animals That Make the News

(*Continued from page xvi*)

One of the most notable deeds ever performed by a homing pigeon was that of "Cher Ami," which carried to an improvised loft in "no man's land" the only message to be received from a lost battalion of American soldiers beleaguered in the Argonne.

Brownie Wins a Home

With a note tied around his neck Brownie tried to get into the automobile of Rev. Vanzandt, of Shell Knob, Mo. The note read: "Won't you please give me a home. I'm good natured, three and a half years old, and need a home. My name is Brownie and I'll do tricks for you. Please don't scold me. I love children." Brownie acted the part and the good reverend found him a new home in the family of a neighbor, Frank Kimball.

This Animal Made the News and Ate It, Too

On April 15, David Kimball, a 16-year-old paper boy of River Forest, Ill., delivered into the custody of the police the village's Public Enemy Number One—a goat with a prodigious appetite. The capture and delivery of the culprit brought a sigh of relief from the officers, because thereby was ended the plethora of complaints they were receiving from residents of the village.

Even the captor had a complaint. He reported, "This goat ate three final editions and bit three columns out of a fourth. When I tried to stop him, he nibbled off part of my shoelace. I hurried home, got my bicycle and tied him to it. Then I had to gag him because he started to chew on my tires."

Earlier on the same day, according to reports of irate citizens, the voracious animal had devoured a half dozen bushes, several doormats and a pair of overshoes left on a porch.

At the police station, the goat found a

(*Continued on page xx*)

WHEREIN YOUR QUESTIONS ABOUT X-RAY ARE ANSWERED

Packed for Service in the Field; complete with Technic Chart.

Q. "From the clinical standpoint, what would I gain from x-ray?"

A. X-ray would be the *voice* of *your* patient, confirming or ruling out the diagnosis you have had to make from objective symptoms.

Q. "Is the use of x-ray confined to small animals?"

A. By no means; the G-E Model "F" Unit is powerful! It gives excellent radiography of the extremities of all large animals in addition to the entire body structure of any small animal.

Q. "What is x-ray's chief economic advantage?"

A. Increase in prestige; the veterinarian who employs x-ray steps out of the "horse and buggy" class, gets better fees because he renders a broader service to the community.

Q. "Which apparatus shall I buy?"

A. It is safe to say that 90% of the x-ray apparatus used by leading schools and practitioners is of G-E manufacture. General Electric pioneered in veterinary x-ray, and today the favorite unit and best investment is the Model "F-3"—SAFE, POWERFUL, PORTABLE, PROFITABLE. It is ideal for veterinary use, is low in price, and may be purchased on terms that are really reasonable.

WRITE *TODAY* FOR COMPLETE INFORMATION

GENERAL ELECTRIC X-RAY CORPORATION

2012 JACKSON BLVD. CHICAGO, ILL., U. S. A.

Bursitis

Contusions

Synovitis

Tendinitis

Sprain

RUPTURE of the MUSCLES

. . these are some of the conditions for which

Antiphlogistine

is indicated and extensively used in leading racing stables of the world.

Its heat and medication stimulate the local circulation, promote absorption of the infiltrations and thereby hasten reduction of the inflammation, swelling and pain.

Sample on request

The Denver Chemical Mfg. Co.
163 Varick St. New York

Animals That Make the News

(*Continued from page xviii*)

new delicacy, the cuspidor, and proceeded to nibble at it until he was removed to the yard outside.

Horse Awarded Grade School Diploma

Curly, a horse owned by the H. M. Smith family of York, Idaho, will be given a diploma at the coming graduation exercises of the York grade school. The diploma will be bestowed by the superintendent of the school in recognition of attendance and devotion to duty, for Curly has carried members of the Smith family to school for twelve years without missing a day. Curly will continue to serve the family, as Franklin Delano Smith, 5, will begin his education next fall.

Egg-Nog Diet for Calves

Rather than to sell his eggs for eleven cents a dozen—the current price in Hurd, N. D.—A. W. Ellsworth, a dairy farmer, prefers to use them as a supplement in the feeding of his 24 calves. He uses four to five dozen eggs a day, mixed with milk, as part of the ration.

Unusual Adoptions

Three baby squirrels and a lone kitten constitute the family being mothered by a cat on the Arbie Peterson farm in Boone, Iowa. The cat adopted the squirrels when the tree they inhabited was cut down.

Old Fruitful, veteran feline of the Brookfield (Ill.) Zoo, recently adopted an orphaned baby raccoon, and that is something cats usually don't do. Even more significant, she devotes far more attention to the 'coon than she does to her own newborn kittens.

This raccoon is one of five discovered in the chimney of a farm house. When found, their eyes were still closed and they seemed half-starved. The only thing that they could do was to cling tenaciously to anything that touched them. Purely as an ex-

(*Continued on page xxii*)

DIETARY SKIN IRRITATION UNKNOWN

Among the 230 exclusively Pard-fed dogs, representing 4 consecutive generations, in Swift's Research Kennels

● Now going into its fifth year, the Pard Generation Feeding Test upholds an amazing nutritional record. 230 dogs—representing Wire-Haired Fox Terriers, Cocker Spaniels, and Chow Chows into the 4th generation—have thrived on an exclusive Pard-and-water diet in the Swift's Research Kennels.

Not one of these 230 dogs while participating in the Pard Generation Feeding Test has ever had a sick day due to digestive disturbances! Nor have such common ailments as listlessness, excessive shedding, or dietary skin irritation ever occurred!

Such a record, based on scientific findings, is convincing proof that Pard is nutritionally balanced—that it deserves your consideration. Recommend Pard with confidence for all breeds.

EVERY CAN *of Pard contains the food elements your dog needs! It is nutritionally balanced . . . and its uniformity is checked scientifically. Pard-fed dogs in Swift's Research Kennels are frequently examined for vitamin and mineral sufficiency.*

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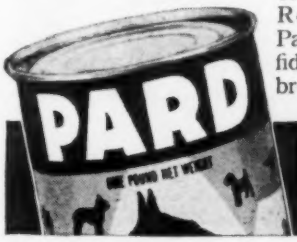

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Your membership in the Association entitles you to secure liability insurance. This privilege, available only to members, affords a highly desirable, almost indispensable protection against damage suits and claims.

For an application write to American Veterinary Medical Association, 221 N. La Salle St., Chicago, Ill.

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among Cats and Dogs

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HILL'S DOG FOOD

The principal ingredient is red meat in a well balanced formula of other ingredients. It is packed under government supervision and, on the basis of biological and chemical analysis, has been granted the Seal of Approval, American Animal Hospital Association.

HILL PACKING CO.
Topeka, Kansas

WRITE FOR SAMPLES

Animals That Make the News

(*Continued from page xx*)

periment, one of these was placed in the care of Old Fruitful. She seems to prize it highly, and it clings to her everywhere she goes.

Monkeys Go Wild Over Ladies' New Hats

Zoo officials in various parts of the country have reported that monkeys have been reacting strangely to women visitors this spring. They bounce up and down wildly in their cages, chatter in hysteria and make bold grabs at feminine onlookers.

It's the new styles in ladies' hats that make them that way; they think they are good to eat. In one case a simian had snatched from a lady's head a straw-colored "confection," trimmed in front with a large, pale green flower. It looked like lettuce and the monkey was nearly going crazy.

It is hoped that they will quiet down after they have adapted themselves to the current fashions.

(*Continued on page xxiv*)

A. V. M. A. EMBLEMS

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LAPEL 50
(Illustrated)

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American Veterinary Medical Association
221 N. La Salle St. Chicago, Ill.

An Open Letter to the Veterinary Profession!

Gentlemen:

No one realizes more fully than Armour and Company the important part you play in the welfare of America . . . the great job you have done in gradually stamping out the scourges of animal disease in this nation.

For that reason Armour and Company have maintained research laboratories to develop new and more effective veterinary glandular and pharmaceutical products for you. For over fifty years these laboratories have been constantly striving to provide you with medicinals which merit your complete confidence. You have responded by making Armour your standard of excellence.

And there is another Armour service aiding you in your fight against that most dreaded of hog diseases . . . cholera. Added to the thorough standardization . . . the complete dependability . . . of Fowler Brand Anti Hog Cholera Serum is the 24 hour a day delivery service which Armour maintains for you at three key points* in the Middle West. That means that when cholera strikes, you're ready to fight it, swiftly and surely . . . ready to fight with a weapon you know to be effective—Fowler Brand Anti Hog Cholera Serum.

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*Dr. R. D. Wall, 910 28th St., Des Moines, Ia., Armour and Company, Indianapolis; Armour and Company, Veterinary Division, Kansas City, Kansas. Fowler Brand Anti Hog Cholera Serum is also available at all Armour Branch Houses and Creameries.

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ALL TERRIERS Trimming Chart, $1; three for $2. Judy's *Dog Encyclopedia*, all dog subjects, $5. *Dog World* monthly, $2 for one year; $3 for two years; $5 for five years. JUDY PUBLISHING COMPANY, 3323 Michigan Blvd., Chicago, Ill.

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PRACTICES furnished and sold—all states. Positions furnished—all kinds, in United States and foreign countries. Assistants—all kinds furnished. Established 33 years. F. V. Kniest, 1537 So. 29th St., Omaha, Neb.

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ONLY HOSPITAL in Redwood City, Calif. Fully equipped. Five-room apartment adjoining. Mixed practice; exceptional opportunity. Retiring because of illness and age. Immediate possession and low rental. Communicate with Dr. H. A. Turner, owner, 621 Winslow St., Crocket, Calif.

Position Wanted

CAPABLE graduate veterinarian wants position as assistant. 15 years experience in both small and large animal practice. Address: "QS," c/o JOURNAL of A. V. M. A., 221 N. La Salle St., Chicago, Ill.

Wanted

SECOND-HAND equine operating table. Must be in good condition and reasonably priced. Reply: "NW," c/o JOURNAL of A. V. M. A., 221 N. La Salle St., Chicago, Ill.

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FREE SAMPLE
NATIONAL BAND & TAG CO. Dept. 6-667, Newport, Ky.

Animals That Make the News

(*Continued from page xxii*)

Phenomenal Twins

A five-year-old Percheron mare owned by Ben Critton, a farmer of Lawrenceburg, Ky., that gave birth to twins a short time ago trotted into the headlines of many leading newspapers. This event certainly merited recognition, for aside from the fact that the odds on twins being born to a mare are about 25,000 to one, it happens that one of the twins is a colt and the other a mule.

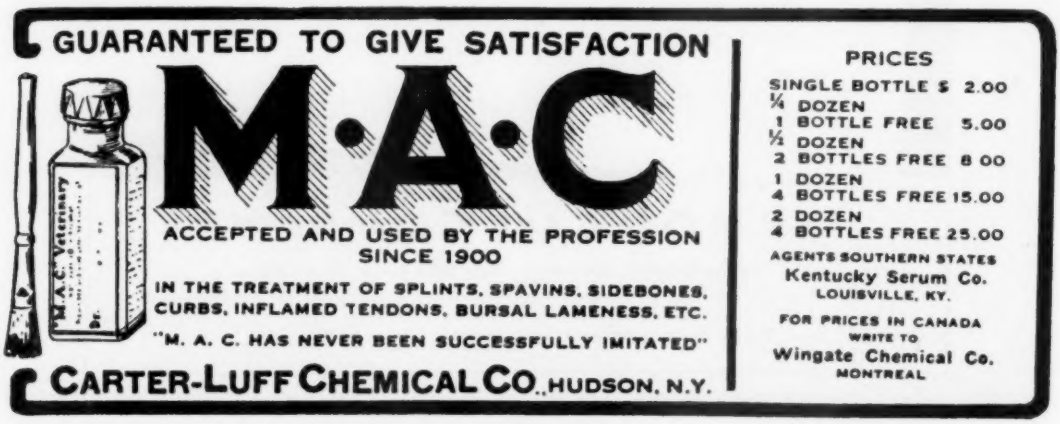
On the Utility of Skunks

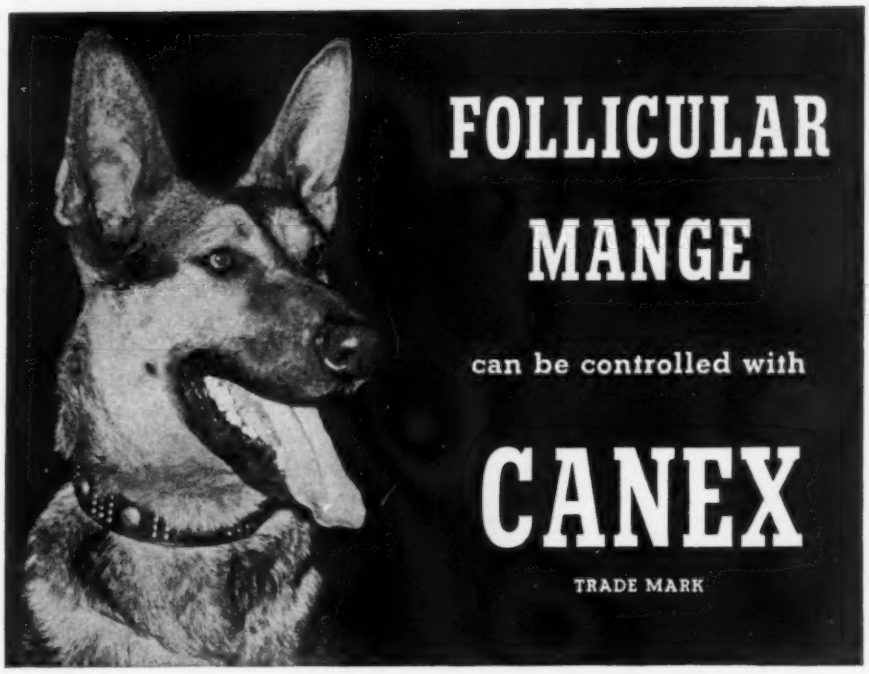
John Norem, a gasoline station proprietor of Wilmington, Del., experienced difficulty in collecting a bill from a motorist. The customer was about to drive away when Norem produced a skunk and warned, "If you don't pay me, I'm going to toss this skunk right in your lap." The stranger paid. Incidentally, the skunk is a pet, deodorized.

The Canary

The canary, member of the finch family, and popular pet of the household, makes *Look* in the form of a pictorial account of its life cycle from mating to maturity. Canary eggs hatch in 13 to 15 days while the male proudly watches and feeds his setting spouse. Three out of four eggs hatch,

(*Continued on page xxvi*)





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Uniform results **Reduced number of applications**
Simplicity and safety of treatments
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The clinical data on Canex is based on reports received from 34 veterinarians in 12 states. In 132 cases reported there were 128 complete recoveries. Canex has also been reported to be effective in the treatment of Sarcoptic Mange and Ear Mites. The sale of Canex is restricted to the veterinary profession and supplies can be obtained from the following distributors:

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"Got a compliment on every dog I clipped with Clipmaster." "Paid for itself the first week I had it."

"Clipped 73 dogs without resharpening."

"Gave excellent service on 300 dogs last summer."

Clipmaster complete with 20 feet of cord, for use on any 110 volt A. C. or D. C. only $17.95. For other voltages $18.95. (Slightly higher west of Denver.) At your dealer's or send us $2.00. Pay balance on arrival. Write for catalog showing special STEWART blades for various purposes. Made and guaranteed by Chicago Flexible Shaft Co., 5506 Roosevelt Road, Chicago, Illinois.

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Closing Out

Binders for the JOURNAL

With the enlarged size of the JOURNAL, effective since July of 1938, larger binders are required for the volumes. There are still available a few of the old binders, which may be used for all volumes concluding with June, 1938. These are offered, while the supply lasts, at the special price of 50 cents each, plus postage. If you wish, the purchase will be billed along with your dues for 1940.

American Veterinary Medical Assn.
221 N. La Salle St., Chicago, Ill.

Animals That Make the News

(Continued from page xxiv)

which is a low percentage of hatchability (we'd say) for natural incubation.

The youngsters, well feathered, hop to the perch at 21 days and begin to sing (badly) at six weeks. Some females sing, but not so well.

Goatmobile

Most people are inclined to associate the goat with bad odors or its mischievous "horning in." J. B. Wiggs, however, has made useful servants out of the goats he owns. *American Magazine* points out that this gentleman of Denton, Texas, rides about in a "goatmobile," the power being supplied by a goat walking on a treadmill. When one tires, a spare goat carried in a cage is substituted.

This Goose Will Not Go to Market

"Goofy" is a goose without wings who came to a commission house in Chicago along with a shipment from Iowa. The name "Goofy," however, is ill-affixed; it should have been "Lucky." For, this gander has had his picture in the newspapers, and the commission house has adopted him as a mascot. Goofy will not be sent to market, he can be certain, because nobody will buy him.

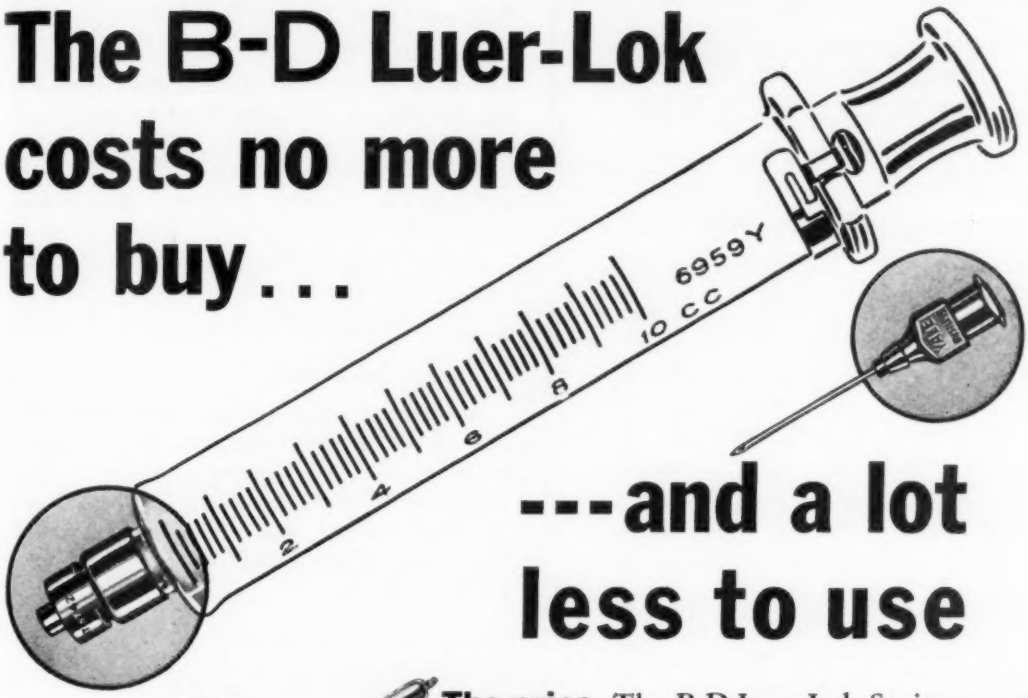
An Emu, large Australian bird, recently showed a flock of sheep to safety after the animals had become trapped in a bush fire in the Grampians Mountains near Melbourne, Victoria.

Monkey Aids G-Men

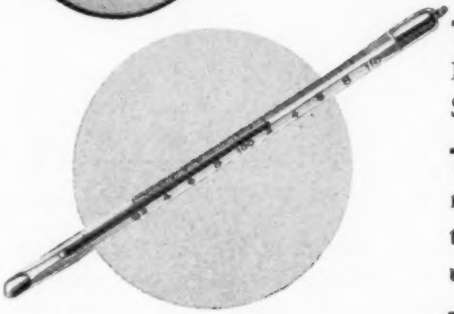
When a monkey makes a monkey out of himself, that isn't news. But when he makes a monkey out of someone else, he is bound to make the headlines. F. J. Nahas stole a car at his home in New London, Conn., and drove to Los Angeles. Then he drove back east to Chicago. While there, he traded in the stolen automobile for a new one and, later, bought a monkey, Jocko,

(Continued on page xxviii)

The B-D Luer-Lok costs no more to buy...



---and a lot less to use



The price. The B-D Luer-Lok Syringe costs NO MORE than the B-D all-glass Luer Slip Syringe.

The first extra value—there's practically no tip breakage because of the extraordinary thickness and strength of the tip. You use up fewer syringes.

The second extra value—the needle can't jump off the Luer-Lok to upset your dosage control, lose valuable time and waste your solution.

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Statement. *A Veterinary Thermometer need not be as accurate as a human fever thermometer.*

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O. V. BRUMLEY, Dean

Animals That Make the News

(Continued from page xxvi)

which he shipped to Miami, Fla. Following, he fell in love, got married and, with his wife, went to Miami to get Jocko. There, the G-men who had traced the monkey were waiting to discuss driving stolen cars across state lines.

Jocko will have to wait a long time before he sees his master again.

A Grave Misnomer

Another famous adage has been disproved, at least as far as John Pritchard, a Colorado farmer, is concerned. A herd of sheep on his farm stampeded and, when he tried to head them off, he was knocked down and crippled badly. As gentle as a lamb? Hokum!

It All Happened on April Fool's Day

A cat owned by Mrs. P. Lenhoff, of Miami, Fla., gave birth to a two-headed kitten on April 1. On the previous April Fool's Day, four kittens were born to the same cat—two of which had double front paws.

Director Floyd Young of the Lincoln Park Zoo (Chicago) was the recipient, on the same day, of a "little black animal with a little white stripe" that came, all crated up, from an anonymous sender. Young told newspaper men, "I 'scented' the joke immediately, opened the crate with care, and placed the animal with the rest of her kind."

Four Drumsticks

A duck that has two extra drumsticks, owned by S. Jutovsky, a Chicagoan, has attracted considerable attention from newspaper reporters and gourmets. Freak webs are so located that the duck can swim on its back.

A fire which damaged a large brooder house of the Seib Hatchery in Lincoln, Ill., on May 4 smothered nearly 10,000 chickens.

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